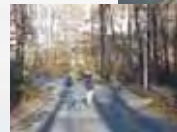


Greensboro Urban Area

2030 Long Range Transportation Plan



August 25, 2004

Acknowledgments

Developing this transportation plan involved cooperation from local government, volunteers, the public, and technical staff. To ensure input from a variety of stakeholders for this plan update, a Technical Committee was formed.

In addition, the Greensboro Urban Area MPO's Technical Coordinating Committee provided technical support and feedback throughout the planning process. Likewise, the policy board of the MPO, the Transportation Advisory Committee, played a crucial role in guiding and ultimately approving the final plan.

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Table of Contents

	Page
Acknowledgements	i
Chapter 1 — Introduction and Vision.....	1-1
Chapter 2 — Existing Roadway and Highway Conditions.....	2-1
Chapter 3 — Future Roadway and Highway Conditions	3-1
Chapter 4 — Environmental Screening.....	4-1
Chapter 5 — Thoroughfare and Collector Street Planning	5-1
Chapter 6 — Bicycle and Pedestrian Element.....	6-1
Chapter 7 — Transit Element.....	7-1
Chapter 8 — Freight Element.....	8-1
Chapter 9 — Aviation Element	9-1
Chapter 10 — Management Strategies	10-1
Chapter 11 — Planning Assumptions and Air Quality Conformity	11-1
Chapter 12 — Financial Plan	12-1
Chapter 13 —Action Plan.....	13-1
 Appendix A — Air Quality Conformity Report	
Addendum 1 — Air Quality Conformity Technical Documentation	
 Appendix B — Public Involvement Results and Public Comments	

Figures, Tables, and Maps

Figures	Page
2.1 — 2002 VMT by Functional Class	2-11
2.2 — 2002 VMT Share by Functional Class.....	2-12
2.3 — 2002 VHT by Functional Class	2-12
2.4 — 2002 VHT Share by Functional Class	2-13
2.5 — 2000 “Average Speed” by Functional Class	2-13
2.6 — 2002 VMT Share by V/C Ratio	2-15
2.7 — 2002 VMT by V/C Ratio by Functional Class	2-15
2.8 — 2002 Congested VMT by Functional Class.....	2-16
2.9 — 2002 Percent Congested VMT by Functional Class	2-16
3.1 — 2002 vs. 2030 E+C: Daily VMT by Functional Class.....	3-6
3.2 — 2002 vs. 2030 E+C: Daily VHT by Functional Class.....	3-7
3.3 — Comparison of 2030 Alternatives – Daily Vehicle Miles of Travel	3-14
3.4 — Comparison of 2030 Alternatives – Daily Vehicle Hours of Travel.....	3-15
3.5 — Comparison of 2030 Alternatives – Over Capacity VMT	3-15
3.6 — Comparison of 2030 Alternatives – Over Capacity Lane-Miles.....	3-16
5.1 — Connectivity and Collector Streets	5-8
5.2 — Collector Street Spacing Guidelines	5-10
6.1 — Public Involvement: Priority LRTP Topics.....	6-2
6.2 — 2000 NC Pedestrian Accident Rates.....	6-5
7.1 — Transit Ridership	7-7
8.1 — 2002 US Freight Tonnage by Mode	8-1
8.2 — 2002 US Freight Ton-Miles by Mode	8-2
8.3 — US Freight Trend Comparison by Mode.....	8-3
 Tables	 Page
2.1 — 2002 Travel and Network Absolute Characteristics by Functional Class.....	2-14
2.2 — 2002 Travel and Network Relative Characteristics by Functional Class	2-14
2.3 — 2002 Vehicle Miles Traveled by V/C Ratio	2-17
2.4 — 2002 Lane-Miles by V/C Ratio	2-17
2.5 — 2002 Vehicle Miles Traveled Breakdown by Functional Class.....	2-18
2.6 — 2002 Lane-Mile Breakdown by Functional Class.....	2-18

2.7 — 2002 Vehicle Miles Traveled Breakdown by V/C Ratio.....	2-19
2.8 — 2002 Lane-Mile Breakdown by V/C Ratio	2-19
2.9 — 2002 Percentage of All Vehicle Miles Traveled by V/C Ratio and Functional Class	2-20
2.10 — 2002 Percentage of All Lane-Miles by V/C Ratio and Functional Class.....	2-20
2.11 — Greensboro Safety Program Improvements List.....	2-22
3.1 — Daily Vehicle Miles of Travel	3-5
3.2 — Daily Vehicle Hours of Travel	3-5
3.3 — Daily “Average Speeds” (VMT/VHT)	3-6
3.4 — Comparison of 2030 Alternatives – Daily Vehicle Miles of Travel	3-11
3.5 — Comparison of 2030 Alternatives – Daily Vehicle Hours of Travel	3-11
3.6 — Comparison of 2030 Alternatives – Lane-Miles	3-12
3.7 — Comparison of 2030 Alternatives – Over Capacity VMT	3-13
3.8 — Comparison of 2030 Alternative – Lane-Miles Over Capacity	3-13
3.9 — Comparison of 2030 Alternatives – “Average Speed”	3-13
3.10 — 2004 Base Year Roadway Projects.....	3-17
3.11 — 2014 Roadway Projects	3-19
3.12 — 2020 Roadway Projects	3-23
3.13 — 2030 Roadway Projects	3-25
3.14 — Exempt Projects List.....	3-28
4.1 — Roadway Projects 2014 Horizon Year Environmental Screening	4-7
4.2 — Roadway Projects 2020 Horizon Year Environmental Screening	4-9
4.3 — Roadway Projects 2030 Horizon Year Environmental Screening	4-10
5.1 — Changes to Roadway Elements in the Proposed Thoroughfare Plan.....	5-3
5.2 — Changes to Intersection Elements in the Proposed Thoroughfare Plan	5-6
6.1 — Most Common Roads for Pedestrian Crashes.....	6-6
6.2 — Projected Expenditures	6-8
7.1 — Transit Costs and Revenues.....	7-5
7.2 — Potential Revenue Sources for Mobility Greensboro	7-10
7.3 — Regional Corridors: Speed and Travel Time	7-14
7.4 — Corridor Ridership.....	7-15
10.1 — Centerline Miles for Existing and Future Conditions.....	10-1
11.1 — Socioeconomic Forecasts.....	11-1
11.2 — Emissions Comparison Summary for Greensboro and High Point Transportation Networks	11-4

12.1 — Greensboro Urban Area 2030 Transportation Plan	
Revenue Forecast Summary.....	12-2
12.2 — Greensboro Urban Area 2030 Transportation Plan	
Cost Summary.....	12-2
12.3 — Roadway Costs and Revenues	12-3
12.4 — Transit Costs and Revenues	12-4
12.5 — Pedestrian and Bicycle Costs and Revenues	12-4
12.6 — Roadway Projects 2004 Horizon Year with Project Costs	12-9
12.7 — Roadway Projects 2014 Horizon Year with Project Costs	12-10
12.8 — Roadway Projects 2020 Horizon Year with Project Costs	12-13
12.9 — Roadway Projects 2030 Horizon Year with Project Costs	12-14
12.10 — Non-Capacity Roadway Project Summary.....	12-15
12.11 — Estimated GTA Transit Costs.....	12-16
12.12 — Estimated PART Express Bus Costs.....	12-17
12.13 — Estimated PART Rail Costs	12-18
12.14 — Estimated Pedestrian and Bicycle Costs and Revenues	12-20

Maps	Page
1.1 — Planning Area	1-3
2.1 — System-Wide V/C Deficiency.....	2-8
3.1 — Horizon Year 2004 Projects	3-18
3.2 — Horizon Year 2014 Projects.....	3-22
3.3 — Horizon Year 2020 Projects	3-24
3.4 — Horizon Year 2030 Projects.....	3-27
4.1 — Environmental Features	4-3
4.2 — Social Features and Historic Districts	4-4
4.3 — Minority Population Distribution Horizon Year Projects	4-14
4.4 — Low Income Population Distribution Horizon Year Projects	4-15
4.5 — Hispanic Population Distribution Horizon Year Projects	4-16
4.6 — Minority Population Distribution Planned GTA and PART Services	4-21
4.7 — Hispanic Population Distribution Planned GTA and PART Services.....	4-22
4.8 — Low Income Population Distribution Planned GTA and PART Services	4-23
5.1 — Thoroughfare Plan	5-7
5.2 — Draft Collector Street Plan	5-13
6.1 — Existing and Planned Sidewalks.....	6-4

6.2 — Existing and Proposed Greenway Trails	6-7
7.1 — Existing Transit Services	7-2
7.2 — Planned GTA and PART Services	7-6
10.1 — IMAP Regional Coverage	10-6

Introduction and Vision

Greensboro, the neighboring towns, and Guilford County are in a time of change. The area's population has grown significantly over the last decade and will continue to grow in the years ahead. Economic growth is also expected over the long term as the area economy diversifies and the restructuring of key traditional industries continues. Growth offers positive opportunities, but also creates a range of challenges for the area, including the development of a transportation system that will meet community and regional needs. At the same time, community priorities regarding transportation and its relationship to broader community objectives have evolved in recent years, as reflected in a wide range of recent community plans and initiatives.

The Greensboro Urban Area Metropolitan Planning Organization (MPO) has developed the 2030 Transportation Plan to be responsive to the challenges of growth and economic change as well as the community's evolving priorities. A reexamination of existing plans to better assess the affects of major planned transportation investments was also a key consideration. These investments include the Greensboro Urban Loop, the J. Douglas Galyon Depot and other GTA service enhancements, the City of Greensboro's aggressive sidewalk construction program, and proposed regional rapid transit services.

The planning process has sought to integrate with local and regional planning initiatives to consider community vision, local corridor context, and environmental goals. Emphasis has been placed on innovative community involvement, inter-governmental partnerships including with newly incorporated towns in the planning area, and a multi-disciplinary approach. A greater emphasis has also been placed on the role of local transportation networks, planned land use, and identified natural, historic, and economic resources.

The plan has been developed in accordance with the federal requirements for MPO Long Range Transportation Plans and air quality conformity analyses. The MPO has worked diligently to satisfy federal requirements, but has complemented this work with a focus on addressing meeting broader community needs and priorities. As such, the 2030 Long Range Transportation Plan has gone beyond previous transportation plans in the level of technical analysis, community outreach and involvement, and intergovernmental collaboration involved in its preparation.

The Vision —

"To develop and maintain a safe, efficient, and environmentally compatible transportation system that provides convenient choices for accessing destinations throughout the Greensboro Metropolitan Area and the Triad, including well-integrated, connected public transportation, pedestrian, and bicycle networks."

Plan Scope

The 2030 Transportation Plan (LRTP) addresses all surface transportation modes, including highways, rails, transit, bicycles, and pedestrians, as well as the connection to aviation. Key elements include:

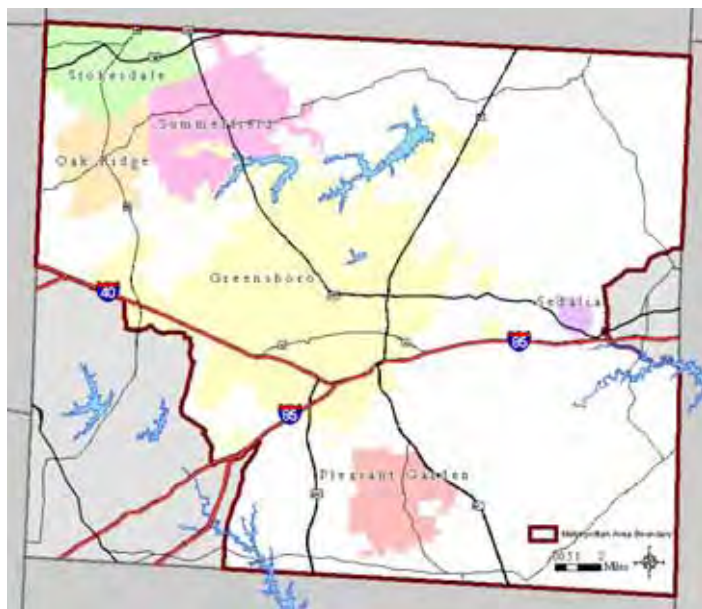
- Identification of future roadway, public transportation, bicycle and pedestrian facility, and rail improvement needs
- An updated thoroughfare plan and a draft collector street plan
- Refined investment strategies in light of anticipated future resource availability and limitations
- Identification of transportation investments requiring further study or new revenue sources
- Transportation policy findings and recommendations
- Supporting financial analysis and a demonstration of conformity to air quality requirements
- Maps and summaries of public involvement and technical analysis

Map 1.1 — Planning Area

Study Area

The MPO, an intergovernmental planning group, led the transportation plan efforts. The MPO is designed to address the complexity of transportation interests and impacts of area-wide transportation planning, and its intergovernmental arrangement worked quite well for the development of a transportation plan for this study area.

This transportation plan addresses the area within the Metropolitan Area Boundary (MAB) which includes the City of Greensboro, area towns, and much of Guilford County (shown in **Map 1.1**). The metropolitan area includes 612 square miles and a population of approximately 316,000. The timeframe for the plan runs through the year 2030.



Coordination with Other Plans

Special consideration was given to the various community plans and major studies to better integrate the 2030 Transportation Plan. These include:

- Mobility Greensboro (GTA Long Range Public Transportation Plan)
- Greensboro Connections 2025 Comprehensive Plan
- Guilford County and Area Town land use plans
- MPO Congestion management system
- PART rail study
- Airport area plans
- Technical analysis

Special consideration was given to area Land Use and Comprehensive

Technical Committee

In order to effectively address the special considerations noted above as well as other key local concerns, a Technical Committee was formed (members of this committee are identified in the Acknowledgements section). The Technical Committee met monthly, and held additional sessions to address specific development topics, including collector street plans and thoroughfare plans.

Each Technical Committee monthly meeting covered specific topics, ranging from updating the long-range planning process, to involvement at public information meetings, to developing goals and objectives, to alternatives analysis. The group identified key issues and assessed public input, providing insight into the analysis of this information. The Technical Committee also identified ways to integrate into the LRTP the findings of relevant plans such as Connections 2025 and Mobility Greensboro.

Public Involvement

The LRTP Update has been built around an extensive public outreach program. This included three rounds of public involvement activities. All public comments received, along with the results of the numerous public meetings are compiled and summarized in **Appendix B** of this document. A complete record of these public comments and opinions is also available in both summary and complete form at www.greensboro-nc.gov/lrtp or by calling 373-GDOT.

Round 1 Public Involvement

The first round of public involvement began with a kickoff meeting at the historic J. Douglas Galyon Depot in downtown Greensboro. Four workshops followed. More than 170 people participated in sessions held in downtown Greensboro, east Greensboro, Northwest Guilford County, and Pleasant Garden. These meetings provided information on the planning effort, and included several means of public input featuring facilitated small group discussions on transportation needs and priorities for the area.

The first round of public involvement also included a statistically valid phone survey of more than 1,200 residents from throughout the planning area. Interviews with City, County, and area Town leaders rounded out the effort.

This information was compiled and made available along with summary information on the Transportation Plan website. After closely studying these findings, the project team identified a wide variety of views. In spite of this, several key themes emerged. These included a broad base of support for:

- The development of sidewalks and other pedestrian facilities
- Improved local and regional public transportation services
- A focus on quality maintenance of roadways and other infrastructure
- A focus on improved traffic operations, including installation of turn lanes and coordinated traffic signal systems
- Strategic roadway widenings and extensions primarily to address bottlenecks, safety issues, and system connection needs
- The development of connected bicycle facility and trail systems
- Enhanced street connectivity
- Efforts to preserve and enhance community character

Round 2 Public Involvement

The second round of public involvement included four public workshops as well as interviews with local elected officials and the Triad Transportation Association. Held at Greensboro City Hall, Summerfield Elementary School, Pleasant Garden Elementary School, and Madison Elementary School (in McLeansville), the workshops built on the information received in the first round of public involvement. Eighty-one people participated in these sessions.

Workshops began with a review of display materials, an extensive presentation on plan issues and questions, and ended with facilitated break-out group discussions. During this round, participants responded to a series of detailed questions regarding future transportation needs, policy issues, concerns and preferences, and specific transportation projects and local issues.

Round two results affirmed the key themes identified in the Round one, and confirmed that a balanced transportation investment plan clearly reflects community preferences.

Round 3 Public Involvement

The third round of public involvement involved four public workshops held at Greensboro City Hall, Summerfield Elementary School, Pleasant Garden Elementary School, and Bessemer Elementary School (in Greensboro). The workshops built on the information received in the first and second rounds of public involvement, including discussion of key elements of the draft plan such as proposed future transportation projects and investment strategies, an updated Thoroughfare Plan, and a draft

Collector Street Plan. Seventy-seven people participated in these sessions.

The workshops included a detailed presentation of the proposed plan and its components. Workshop participants were given the opportunity to review plan materials in detail, and to discuss questions and concerns with MPO staff. Comments were recorded through written comment forms with space for open ended comments as well as questions about various plan elements. Discussion included local and project related concerns. Written comments were generally supportive of the various plan elements.

Final Public Meeting and Document Review Period

The public review period on the proposed plan document began on July 12, 2004 and concluded on August 11, 2004. The proposed plan document was available along with the Air Quality Conformity Analysis Report on the MPO website as well as in printed form at area libraries and government offices.

Instructions for making public comments were included, and these noted the availability of various supporting materials on the LRTP website, including documentation of earlier rounds of public involvement and the Congestion Management System report.

A final public involvement meeting was held on July 29th from 6:00pm to 7:30pm in the Greensboro City Council Chambers. A presentation provided an overview of the plan document, and a range of plan materials were displayed for public review and comment. Input was gathered through general comment forms. Comments received during the document review period are documented along with MPO responses and background material as an excerpt of *Appendix B: Public Involvement Results & Public Comments*, available on the LRTP website.

Analysis

The project team used a range of analysis tools to assess existing and future conditions and choices, including the Piedmont Triad Regional Travel Demand Model. One element of this work was an analysis of existing and near term roadway system deficiencies and the identification of traffic operational strategies that can be used at specific locations to maximize existing roadway capacity prior to or instead of widening (the Congestion Management System). Other elements included a study of what could be expected to occur by the year 2030 under three divergent future transportation investment scenarios. These investment scenarios, accompanied by maps and other explanatory material, were presented for discussion during the second round of public workshops in February 2004. This analysis work is described in detail in Chapter 3 and included:

- Regional Travel Demand Modeling
- Review and revision to the thoroughfare plan
- Assessment of existing conditions
- Congestion Management System
- Environmental screening

Three Scenarios

The first scenario evaluated the performance of Existing plus Committed (E+C) projects. These projects have funding or other public commitments, and are assumed to be the basic building blocks of the final LRTP.

The second scenario evaluated a Highway Focus. This scenario built on the E+C by adding substantial additional highway improvements targeted to areas where significant future congestion is expected. In contrast, public transportation and pedestrian and bicycle accommodations were held to the E+C level. This scenario illustrated that an exclusive focus on new roadway capacity will not be enough to meet future needs, and that some potential widening needs may not be feasible.

The third scenario evaluated an Alternative Focus. This scenario assumed a major expansion of local public transportation, implementation of regional rapid transit, improved local street connectivity, technology improvements, as well as expanded bicycle and pedestrian accommodations. No major expansion of roadway capacity beyond the E+C was assumed. This scenario demonstrated that an exclusive focus on transportation alternatives would not be enough to meet the full range of area transportation needs.

These scenarios helped to illustrate the transportation challenges and opportunities facing the Greensboro area in the years ahead. None of them offered a complete strategy for meeting area needs, and yet each had a story to tell about where the area may be headed, and how a range of choices may affect future outcomes. Review and discussion of the implications of these scenarios was a key part of the second round of public workshops, and helped to clarify the need for a balanced scenario for the 2030 Transportation Plan, as well as specific local and facility issues.

Financial Plan

In accordance with federal transportation regulations, the LRTP must be fiscally constrained. In other words, the plan must demonstrate that the transportation projects indicated in the plan can be implemented based on reasonable future-year funding expectations. This includes the use of traditional public and private funding mechanisms such as taxes, bonds, and the

Transportation Improvement Program as well as other potential revenue resources.

The purpose of a financial plan is in part to ensure that adequate funding exists to support the future transportation needs of the area and to inventory any potential shortfalls. More information about the financial element of the plan can be found in Chapter 12 of this report.

Conformity Analysis

The Greensboro MPO, NCDOT Transportation Planning Branch, and North Carolina Department of Environment and Natural Resources (DENR) Air Quality Division have been working cooperatively on the air quality conformity analysis for the transportation plan. The purpose of this analysis is to verify compliance with the provisions of the Clean Air Act Amendments of 1990 and the Transportation Equity Act for the 21st Century. It also is intended to confirm that the fiscally constrained LRTP eliminates or reduces violations of the National Ambient Air Quality Standards (NAAQS) in Guilford County.

The assessment of the LRTP was completed in June 2004, determining that the plan accomplishes the intent of the North Carolina State Implementation Plan (SIP). A copy of the conformity report can be found in **Appendix A**.

Seven Planning Factors

The Transportation Equity Act for the 21st Century (TEA-21) requires all MPOs to consider seven broad planning factors in the development of the transportation plans and programs. These seven factors are listed below:

- Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency
- Increase the safety and security of the transportation system for motorized and non-motorized users
- Increase the accessibility and mobility options available to people and for freight
- Protect and enhance the environment, promote energy conservation, and improve the overall quality of life
- Enhance the integration and connectivity of the transportation system for people and freight
- Promote efficient systems management and operations
- Emphasize the preservation of the existing transportation system

These seven planning factors played a significant role in the development of the 2030 Transportation Plan. They influenced the development of each of the Plan's elements.

When considering the *economic vitality* of the area it became apparent that the Plan needed to provide improved access to underdeveloped areas where land use plans have targeted growth or redevelopment. The Plan also consistently seeks to improve *safety and security* for all modes. This was primarily accomplished through design recommendations, transit amenities, and provisions that promote a defined pedestrian and bicycle realm as a part of the transportation system. The movement of *freight* was another significant consideration, especially when identifying future highway needs and developing strategies intended to improve access to the airport where the future Fed-Ex terminal is planned. Transportation *connectivity* also played a significant role as the planning process considered ways to improve the integration and transition between modes. The plan is focused on improving system-wide connectivity and even goes beyond federal requirements by including a draft collector street plan for the entire study area. The Congestion Management System and Management strategies noted in the plan seek to maximize the *efficiency and operations* of transportation corridors as well as of the entire system, primarily through the use of technology and travel demand management strategies.

Finally, *preservation* of the existing transportation system could be considered the cornerstone of the plan. The use of technology, land use strategies, and access management tools combine to prolong the performance of the system, thereby lessening the need for extensive expansions to the planned system. The addition of the collector street plan serves as further evidence of the plan's commitment to preserving the current system by improving mobility throughout the study area, thereby reducing reliance on arterials and reducing impacts to critical transportation nodes.

Key Findings

The Greensboro Urban Area is in a time of change. Future population and economic growth are expected, as is continuing economic restructuring and diversification. Major transportation investments such as the Urban Loop and the Depot and the pace and direction of growth and development will change future traffic patterns in ways that can not yet be fully anticipated. The transportation planning environment is therefore a dynamic one.

The 2030 Transportation Plan document represents a kind of snapshot, a representation of transportation needs, priorities, and resources as they are currently understood. As time passes transportation system conditions will change, as will the understanding of the area's needs, priorities, and resources. Future transportation plan updates will reflect these changes, but they will also build off of the public involvement, the technical analysis, and the intergovernmental coordination of the 2030 Transportation Plan effort.

The Result: A Transportation Planning Guide

The Greensboro Urban Area 2030 Transportation Plan is intended to serve as a tool for guiding the implementation of the future transportation system in the area. Much additional work remains to be done to implement most of the plan's recommended strategies – but the plan can serve as a guidepost along the way.. This document summarizes the planning process and details for each of the plan's various elements including:

- Existing Roadway and Highway Conditions (Chapter 2)
- Future Roadway and Highway Conditions (Chapter 3)
- Environmental Screening (Chapter 4)
- Thoroughfare and Collector Street Planning (Chapter 5)
- Bicycle and Pedestrian Element (Chapter 6)
- Transit Element (Chapter 7)
- Freight Element (Chapter 8)
- Aviation Element (Chapter 9)
- Management Strategies (Chapter 10)
- Planning Assumptions and Air Quality Conformity (Chapter 11)
- Financial Plan (Chapter 12)
- Action Plan (Chapter 13)

Each chapter includes background information regarding the element as well as a set of summary recommendations at the end. The final chapter concludes with the Action Plan that communicates next steps and roles and responsibilities for implementation. The adoption resolution and air quality conformity finding are enclosed under Appendix C.



Existing Roadway and Highway Conditions

Background

Quantifying current traffic conditions in the planning area presents some special challenges. Extensive roadway construction has been underway continuously since the last update to the *Long Range Transportation Plan (LRTP)* in 2001. In particular, the widening of I-40 has had major impacts:

- The diversion of traffic off of I-40 onto other routes temporarily alters their traffic volumes, their levels-of-service, and even their capacities. The significance of this impact varies, and cannot be easily determined, but it is often substantial.
- The closure of certain interchanges, individual ramps, and overpasses changes traffic patterns, not only on the road directly affected by the construction, but on intersecting and parallel routes as well.
- Even upon completion of a project, it can take considerable time for drivers to adjust to the new facility, and for traffic patterns to stabilize.

A quick inspection of interstate traffic counts from 1999 through 2002 confirms the problems described above. Traffic volumes increase from 1999 to 2000, remain relatively unchanged in 2001, and drop significantly in 2002. The 2002 volumes generally fall between 1999 and 2000 levels, although at several locations the Average Daily Traffic (ADT) is lower in 2002 than in 1999.

Work on the Greensboro Urban Loop also has caused major disruptions in traffic flow, as cross streets are reconstructed, rerouted, or closed (either permanently or temporarily). Numerous other projects also have been under construction during the same period; while the duration and magnitude of the impacts of each of these was much smaller than for I-40 or the Urban Loop, when taken together they further exacerbate the situation.

Given the extent of all these projects, both in terms of the area involved and the volume of traffic affected, system-level analysis of actual traffic conditions during the past two years is of limited use in updating the Greensboro Urban Area 2030 Transportation Plan. Furthermore, the recent economic recession has resulted in a relatively low rate of overall growth in population, employment, and traffic over the last two years. Therefore, for the purposes of

this study, the analysis conducted for the 2001 plan update (using mainly 1999 and 2000 data) is probably more relevant than an analysis relying on data from 2001-2003. In either case, the most critical problem areas are still identified, even if the associated numbers may not be identical.

It should be noted that upon completion of this round of major project construction, traffic volumes can be expected to climb significantly, as drivers adjust to increased capacities and reduced travel times. This shifting of travel routes to take advantage of increased convenience (sometimes referred to as *latent demand*, or *induced travel*) will undoubtedly reveal new deficiencies. Traffic bottlenecks may become evident in places that currently function adequately.



Urban Loop under construction

Major Facilities

National Highway System

Interstate 40 and Interstate 85 are the most important highways in the planning area and the Piedmont Triad Region. These routes serve commuters, shoppers, truckers, vacationers, and others on trips within, into, out of, and through the planning area.

The merging of Interstate 40 and Interstate 85 between Greensboro and Hillsborough carries daily traffic volumes approaching 145,000 in "The Valley." These are among the highest traffic volumes anywhere along Interstate 40, and are the second highest in North Carolina, behind only Interstate 77 in Charlotte.

East of Greensboro, Interstate 40/85 is eight lanes wide. At the western end of the planning area, Interstate 40 extends toward southern Winston-Salem. The segment of Interstate 40 between Holden Road and the Business I-40 split, just west of Sandy Ridge Road, has been widened to an 8- to 10-lane section. This multi-year widening project (combined with the elimination, construction, and modification of interchanges to accommodate the Greensboro Urban Loop) is the genesis of most of the discussion in the previous section of this report.

Interstate 85 southwest of Greensboro is a six-lane freeway into the High Point/Thomasville area. Interstate 85 narrows to four lanes south of Thomasville. Further south, it provides access to Charlotte and Atlanta. Variable message signs, video surveillance, and motorist assistance patrols have been set up to help manage congestion on both interstates.

Although US 220 and NC 68 do not currently meet interstate standards, portions of these facilities are anticipated to comprise

the backbone of the future Interstate 73 corridor. US 220 is the main north-south axis for travel between Martinsville, VA and Asheboro, although the connection through the planning area is neither direct nor convenient. To the south, US 220 is a four-lane freeway; to the north, cross-sections vary from two-lane to four-lane divided.

NC 68 provides an alternate corridor farther west, offering better access to the Piedmont Triad International Airport (PTIA) area and High Point, although portions of the two-lane alignment to the north are less than ideal. Other portions are four-lane divided/freeway. A recently completed partnership project of the NCDOT and the City of Greensboro improved roadway alignment and intersection operations between West Market Street and Gallimore Dairy Road. The programmed US 220/NC 68 Connector project will partly shift the major north-south route to the NC 68 corridor. The planned development of a Federal Express transfer hub and third runway at PTIA will have a significant impact on this facility (among others), requiring additional improvements. The Airport Area Transportation Study (AATS) examined the need for and feasibility of 20 different alternatives for future connections to PTIA in western Guilford County. The draft final version of this study includes a preferred alternative and recommendations for further study.

US 29, identified as a Congressional High Priority Corridor, is the principal arterial connection to the northeast. This four-lane freeway is an important route for commodities movement, connecting Greensboro to Reidsville, Danville, VA and Lynchburg, VA. The segment between I-40 and Summit Avenue falls well short of modern design standards with respect to several key elements, including interchange design and shoulder and median width. Substantial development (or re-development) is anticipated in the vicinity of Eckerson Road, Cone Boulevard, and other portions of northeast Guilford County. Combined with the impacts of the Urban Loop and its interchange with US 29, this facility faces dramatic changes in both the amount and type of traffic it serves. Several studies have already been initiated to address the issues just described.

The most important facility to the southeast is US 421, a multi-lane highway connecting to Sanford. To the west of Greensboro, US 421 follows the route of Business I-40 through Winston-Salem. Access management and the impacts of the Urban Loop are key issues for both these segments of US 421.

Other Regionally Significant Facilities

High Point Road has traditionally been the primary link from Greensboro to High Point and Jamestown. High Point Road is

critical for reaching major activity centers such as Four Seasons Mall, the Greensboro Coliseum Complex, and Guilford Technical Community College. Since capacity increases through widening are prohibitively expensive and disruptive, Advanced Traffic Management Systems (ATMS) including reversible lanes, variable message signs, and video surveillance have been installed along High Point Road between Interstate 40 and Lee Street. While this system is used primarily for Coliseum events, more general application is envisioned.

Wendover Avenue is a critical multiple-function facility. Throughout Greensboro, the roadway ranges from four to seven lanes, some portions divided with full access control, and functions as both a radial and circumferential route. Segments of Wendover Avenue are designated as US 70 and US 220. Roadway and intersection improvements were completed recently on portions of Wendover Avenue between Bridford Parkway and Edwardia Drive.

To the east, US 70, which follows East Wendover Avenue and Burlington Road, is the main alternate to Interstate 40 for travel to Burlington. Widening and realignment has been completed in the vicinity of the interchange with the eastern Urban Loop. West of Greensboro, the newly widened western leg, ranging from four to seven lanes, primarily divided with some access control, forms a high-growth commercial and residential corridor between Greensboro and High Point.

Bryan Boulevard serves as a major connection between downtown Greensboro and the PTIA/NC 68 area. Bryan Boulevard is a four-lane freeway connecting two facilities with partial access control, Airport Parkway and Benjamin Parkway. This facility is currently being realigned to accommodate the third runway at PTIA and to reconfigure airport area access.

Major Local Facilities

Vehicular travel in Greensboro is aided by a strong network of radial arterials, serving traditional patterns of travel between outlying areas and downtown. While not as comprehensive, a circumferential system has developed to meet the growing demand for cross-town (or suburb-to-suburb) travel. Elements of this system can be conveniently organized with respect to the geographic area served.

Holden Road, for example, acts as an inner loop for western Greensboro. When combined with Cone Boulevard to the north, it provides near-continuous circumferential mobility from Randleman Road to US 29.

To the north, Lawndale Drive, North Elm Street, Church Street, Yanceyville Road, and Summit Avenue provide access to residential and commercial development between US 220 and US 29 south of Lakes Brandt, Townsend, and Jeanette. Cross-sections vary from two-lane to five-lane. The main cross-town facilities in this area (other than Wendover Avenue) are Cone Boulevard (four-lane divided) and Pisgah Church/Lees Chapel Road (five-lane/four-lane).

Aside from Bryan Boulevard and West Market Street, Friendly Avenue is the primary radial facility in western Greensboro, roughly defined as the area between Battleground Avenue, Interstate 40, and the Piedmont Triad International Airport. It is primarily a five-lane facility, carrying up to 40,000 vehicles per day. The section between Holden and Westridge Roads has experienced substantial traffic growth in the past two years, and near-term improvements are programmed. A number of intersecting roads combine to form a circumferential system. Holden Avenue is the innermost, followed by Westridge and Muirs Chapel Roads, and finally Guilford College/New Garden Road. These are all two-lane to five-lane roads.

Wendover Avenue, Aycock Street/Westover Terrace, Florida Street, and US 29 form a perimeter around central Greensboro and two major universities, the University of North Carolina, Greensboro and North Carolina Agricultural & Technical University. Downtown, several one-way streets provide efficient access: Greene and Davie Streets are the main north-south components, while Friendly and Market form the east-west axis.

In combination, Spring/Edgeworth, Fisher/Smith, Murrow Boulevard, and Lee Street serve as a circumferential route within the Greensboro central business district. Spring Garden Street is UNC-G's main street, while East Market Street is NCA&T's. Spring Garden Street was recently improved with a special emphasis on pedestrian, bicycle, and transit considerations. Similar improvements are underway on East Market Street. Lee Street to the east and Patterson Street to the west offer the most direct route for accessing downtown Greensboro from either Interstate 40 from the west or Interstate 40/85 from the east.

Southwest Greensboro is beginning to converge with northeast High Point. West Wendover Avenue, High Point Road, and Guilford College Road, create parallel corridors spanning the high-growth area between both cities. They provide both access to developing land and mobility for through traffic. Guilford College Road was recently realigned and grade-separated to accommodate access to the Urban Loop and Wendover Avenue. The combination of Piedmont Parkway/Hilltop Road/Groometown Road creates the only major route perpendicular to these corridors. The continuity of this cross-town route suffers from

differences in cross-section, with Piedmont Parkway being four-lane divided, Groometown Road two-lane to five-lane, and Hilltop Road mostly two-lane. Planned improvements to Hilltop Road and Groometown Road will give this corridor a continuous minimum four-lane cross-section. Holden Road and Vandalia Road are the other significant local facilities in this area.

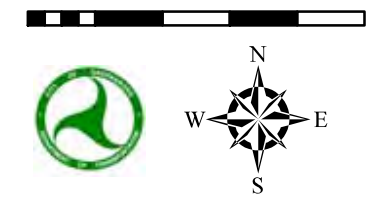
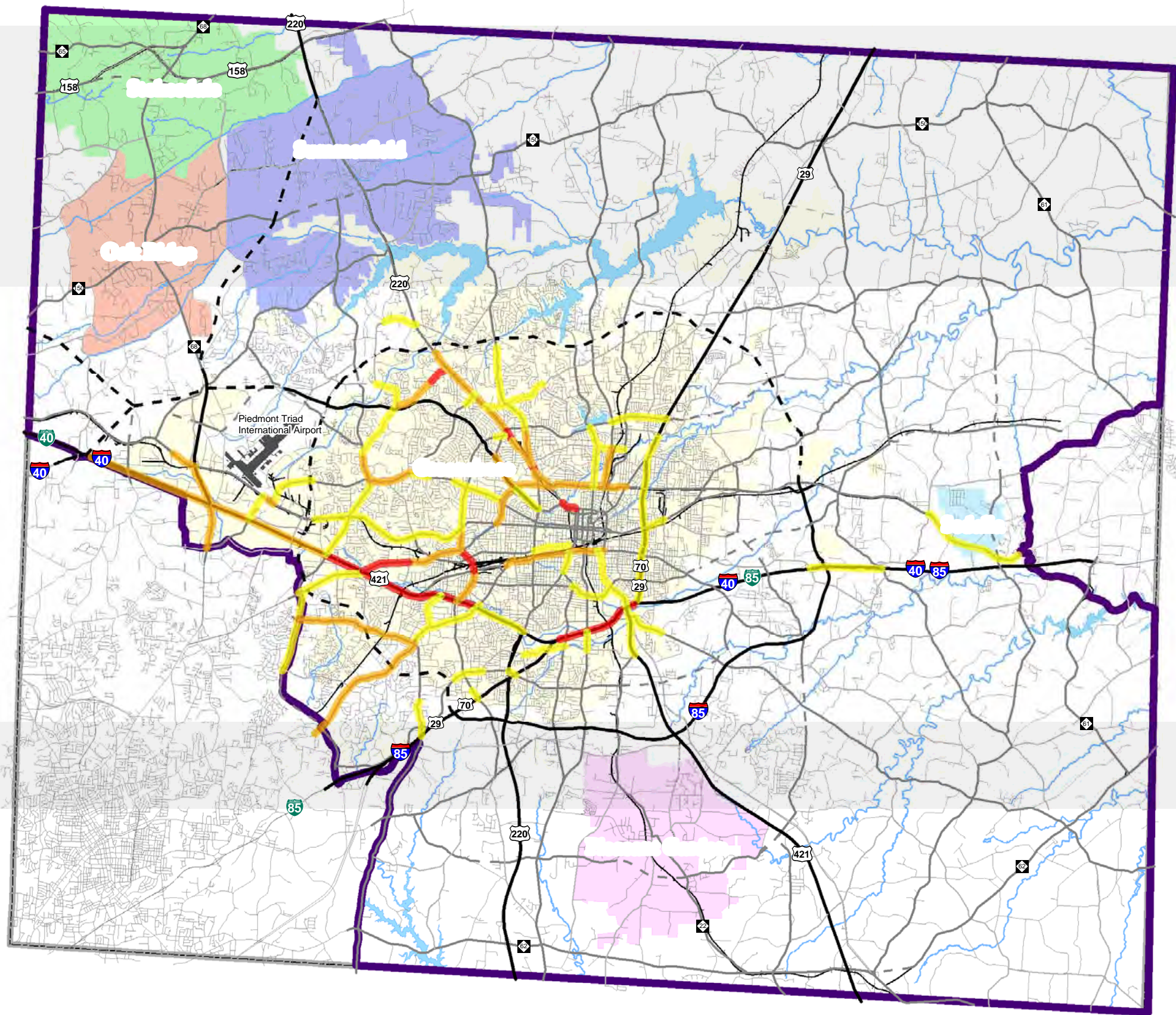
Many important facilities fan out across the southern Greensboro area. To the west, both US 220 and Randleman Road feed Freeman Mill Road, which has been widened and improved to a primarily four-lane divided cross-section. On the east, US 421, Pleasant Garden Road, Liberty Road, and Alamance Church Road all converge into Martin Luther King, Jr. Boulevard for access to downtown. Elm-Eugene Street and MLK Jr. Boulevard both have interchanges at Interstate 40/85. The most important local cross-town facilities in this area are Florida Street and Vandalia Road.

Main radial arterials in east Greensboro include East Market Street/Huffine Mill Road, Lee Street, and US 70. Cross-sections on these facilities vary from two lanes to a five-lane divided section. US 29 is the only major cross-town route.

Results of the analysis of existing capacity deficiencies are summarized graphically in **Map 2.1**. This figure depicts the location and severity of congestion on existing Thoroughfare Plan roadways. The Congestion Index used here reflects a somewhat subjective weighting of results from the CMS, PTRTDM, and field observation. In general, the following guidelines are followed in identifying and classifying congestion:

- **Over Capacity** – On these facilities, traffic volumes exceed capacity by at least 20% (volume-to-capacity ratio > 1.2), calculated either on a daily basis or during one or more peak periods. Severe and persistent congestion occurs on a regular basis. This condition typically corresponds with a level of service of F.
- **At Capacity** – The volume-to-capacity (V/C) ratios on these facilities range from 1.0 to 1.2. Moderate congestion exists for extended periods, and frequently becomes more severe, although not necessarily on a regular basis. This condition typically corresponds with a level of service of E, or possibly F.
- **Approaching Capacity** – Although traffic volumes on these facilities do not exceed their maximum (or ultimate) capacity, they are within 20% of this threshold (V/C ratios between 0.8 and 1.0). Under these conditions, there is enough intermittent congestion to cause some delays. With little reserve capacity available, minor incidents can trigger more significant delays. LOS in this category is typically D, but can range from C to E.

Upon completion of the above-referenced construction, the major deficiencies identified in the 2001 *Existing Conditions* report (related to I-40 and I-85) should be significantly improved. Deficiencies in other congested corridors (Wendover Avenue, US 220, High Point Road, Hilltop Road, New Garden Road, Friendly Avenue, etc.) should be at least partially addressed through currently programmed projects. Deficiencies at other locations (Holden Road, NC 68, US 29) not currently addressed by specific, committed projects may experience some relief upon completion of these committed projects; other deficiencies, however, may appear.



System Level Performance Measures

The most meaningful system performance measures are described below, as is the functional classification system used to stratify the results.

Vehicle-Miles of Travel (VMT) is a measure of the total distance traveled by all vehicles on a road network. It is sensitive to both the number of vehicle-trips and the distance traveled per trip. VMT is calculated by multiplying the traffic volume on each link in the road network by the length of that link, and summing these products. VMT is a key input for estimating fuel consumption and tailpipe emissions, and is useful for comparing the performance of transportation alternatives.

Vehicle-Hours Traveled (VHT) is an aggregate measure of the amount of time vehicles spend traveling on a road network. As with VMT, both the number of trips and trip length influence VHT, but travel speed is also a factor. Increased congestion can raise VHT, even if average trip length does not grow. Conversely, if speeds increase, VHT can go down even as trip lengths increase. VHT is a useful indicator of the relative efficiency of alternative transportation systems. It can also be used to help estimate fuel consumption and air pollution.

Lane-Miles is the number of through-lanes on each segment of roadway times its length, summed across the entire network. It is a simple measure of the overall potential capacity of the highway system.

Average Speed is a somewhat abstract and relative measure, derived by dividing a network's VMT by its VHT. The resulting speed is not usually considered a realistic or typical speed in absolute terms, but can be useful in comparing the rate and efficiency of travel between alternative scenarios.

Volume-to-Capacity (V/C) Ratios are used to express the quality of traffic service on a facility or system. A low ratio corresponds with a high level of service (LOS A or B), indicating relatively free-flowing traffic. A high V/C ratio (1.0 or higher) means conditions are congested (LOS E or F). Capacity, as it is used here, is defined as the maximum, or ultimate (LOS E) capacity. V/C ranges are often used to define different levels of congestion. Four such ranges are used in this study:

Ratio	Capacity	Level of Service	Congestion
$V/C < 0.8$	Below capacity	A, B, or C	Little or no congestion
$0.8 \leq V/C < 1.0$	Approaching capacity	C, D or E	Some intermittent congestion
$1.0 \leq V/C < 1.2$	At capacity	E or F	Moderate, consistent congestion
$V/C \geq 1.2$	Over capacity	F	Severe and persistent congestion

s, and contribute a relatively small
Note that these statistics are only for
model. Because they are not
carry such small volumes, most local
l.

2.9 focus on the quality of traffic
on, as expressed by the V/C ranges
es present VMT totals by V/C range,
il class, both in absolute terms and as
les 2.3, 2.5, 2.7, and 2.9 present
rent tabular formats. These tables
vn in various ways to emphasize
4, 2.6, 2.8, and 2.10 provide
/C characteristics in terms of lane-
c observations derived from these
:

eled in the study area experience
ercent occur under severely
wever, less than 20% of lane-miles
with just over 3% being severely
that most congestion is concentrated

on high-volume facilities.

- In fact, about 1/2 of interstate VMT experiences some congestion (not considering construction related delays). On other principal arterials, 2/3 of the VMT experiences some congestion, and 22% occurs under severe congestion, by far the highest proportions of any functional category.

Greensboro Urban Area 2030 Long Range Transportation Plan

- In absolute, system-wide terms, most severe congestion ($V/C > 1.2$) is associated with minor arterials. Minor arterials represent 38.7% of the VMT and 40.8% of the lane-miles (38 lane-miles) experiencing severe congestion.
- For V/C greater than 0.8 (at least some congestion), minor arterials represent 32.2% of the VMT, and 39.6% of the lane-mileage (207 lane-miles). The corresponding figures for interstates are 35.1% of VMT, and 21.8% of lane-mileage (114 lane miles). Given that interstates are at least four lanes and most minor arterials are two lanes, this translates to about 94 miles of congested minor arterials, and 28 miles of congested interstate.
- Non-interstate freeways and local streets experience very little congestion.

Figure 2.1 — 2002 VMT by Functional Class

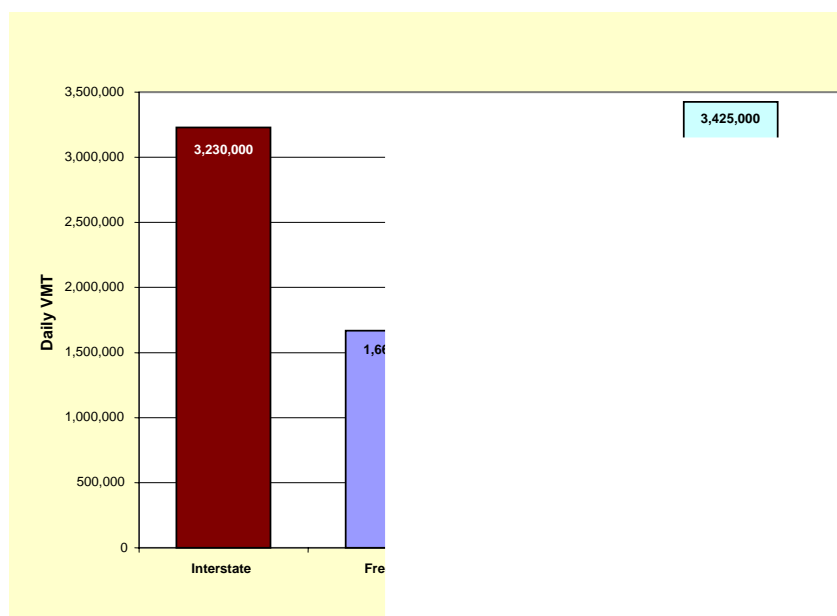


Figure 2.2 — 2002 VMT Share by Functional Class

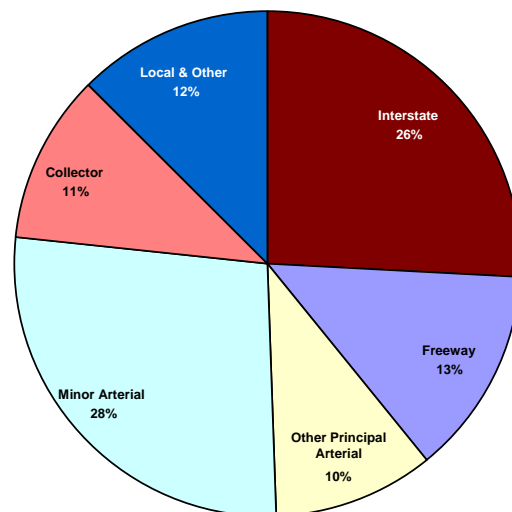


Figure 2.3 — 2002 VHT by Functional Class

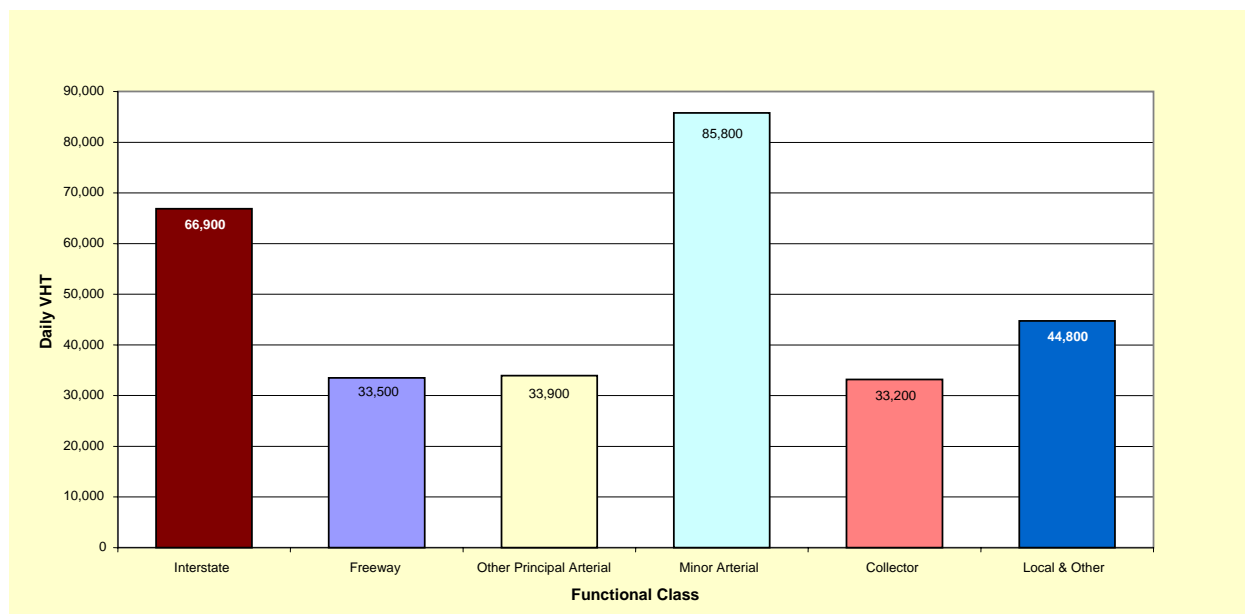


Figure 2.4 — 2002 VHT Share by Functional Class

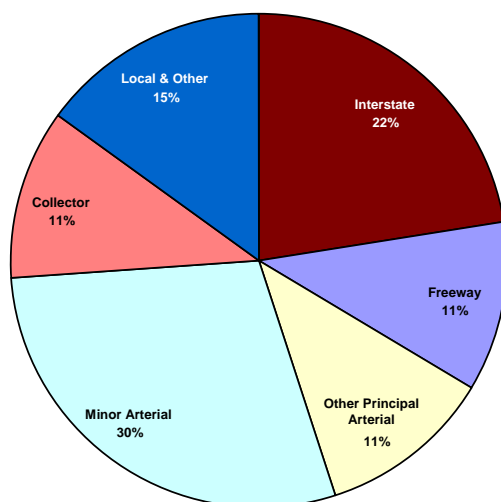


Figure 2.5 — 2000 "Average Speed" by Functional Class
(Average = 42 mph)

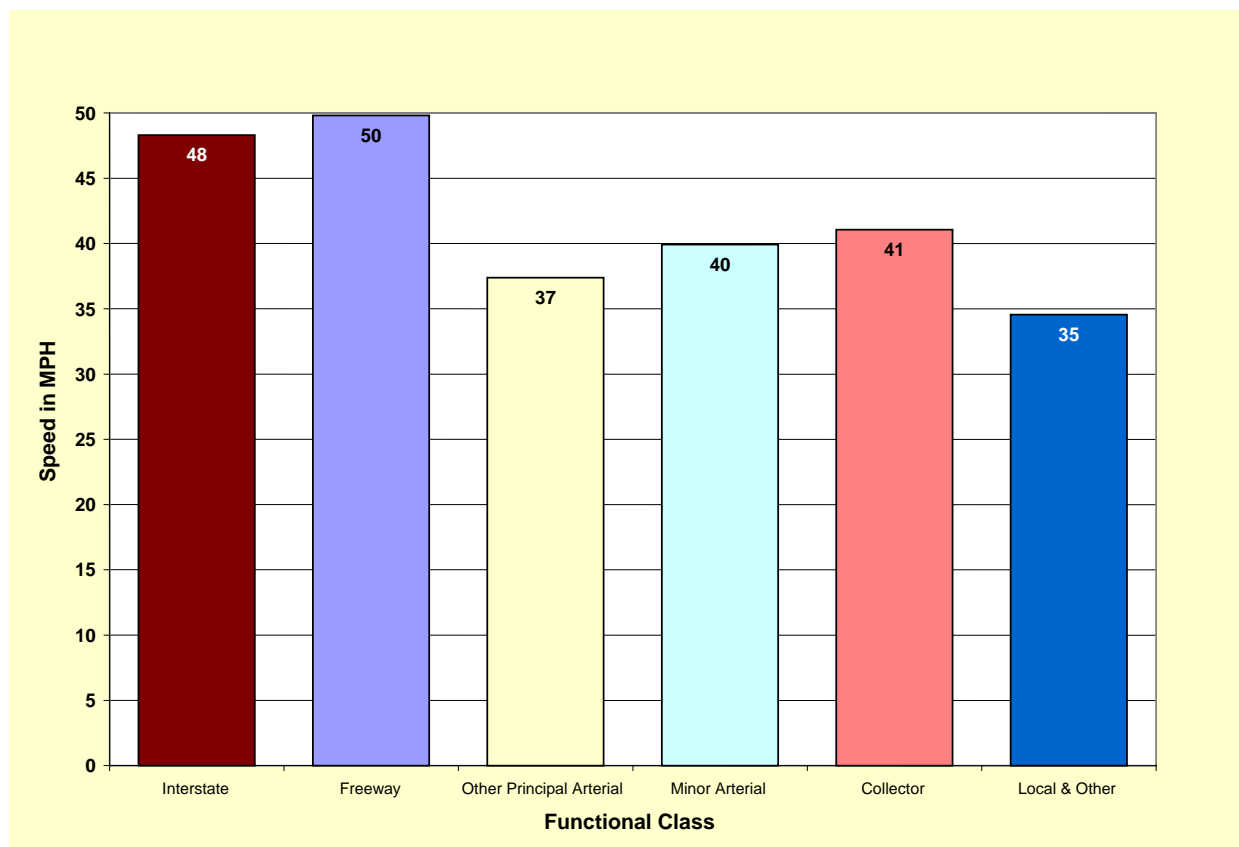


Table 2.1 — 2002 Travel and Network Absolute Characteristics, by Functional Class

Functional Class	VMT	VHT	Average Speed	Lane-Miles
Interstate	3,230,000	66,900	48.3	280
Freeway	1,668,000	33,500	49.8	280
Other Principal Arterial	1,269,000	33,900	37.4	208
Minor Arterial	3,425,000	85,800	39.9	829
Collector	1,361,000	33,200	41.1	511
Local & Other	1,547,000	44,800	34.5	516
TOTAL	12,500,000	298,000	41.9	2,624

Table 2.2 — 2002 Travel and Network Relative Characteristics, by Functional Class

Functional Class	VMT	VHT	Lane-Miles
Interstate	25.8%	22.4%	10.7%
Freeway	13.3%	11.2%	10.7%
Other Principal Arterial	10.2%	11.4%	7.9%
Minor Arterial	27.4%	28.8%	31.6%
Collector	10.9%	11.1%	19.5%
Local & Other	12.4%	15.0%	19.7%
TOTAL	100.0%	100.0%	100.0%

Figure 2.6 — 2002 VMT Share by Volume/Capacity Ratio

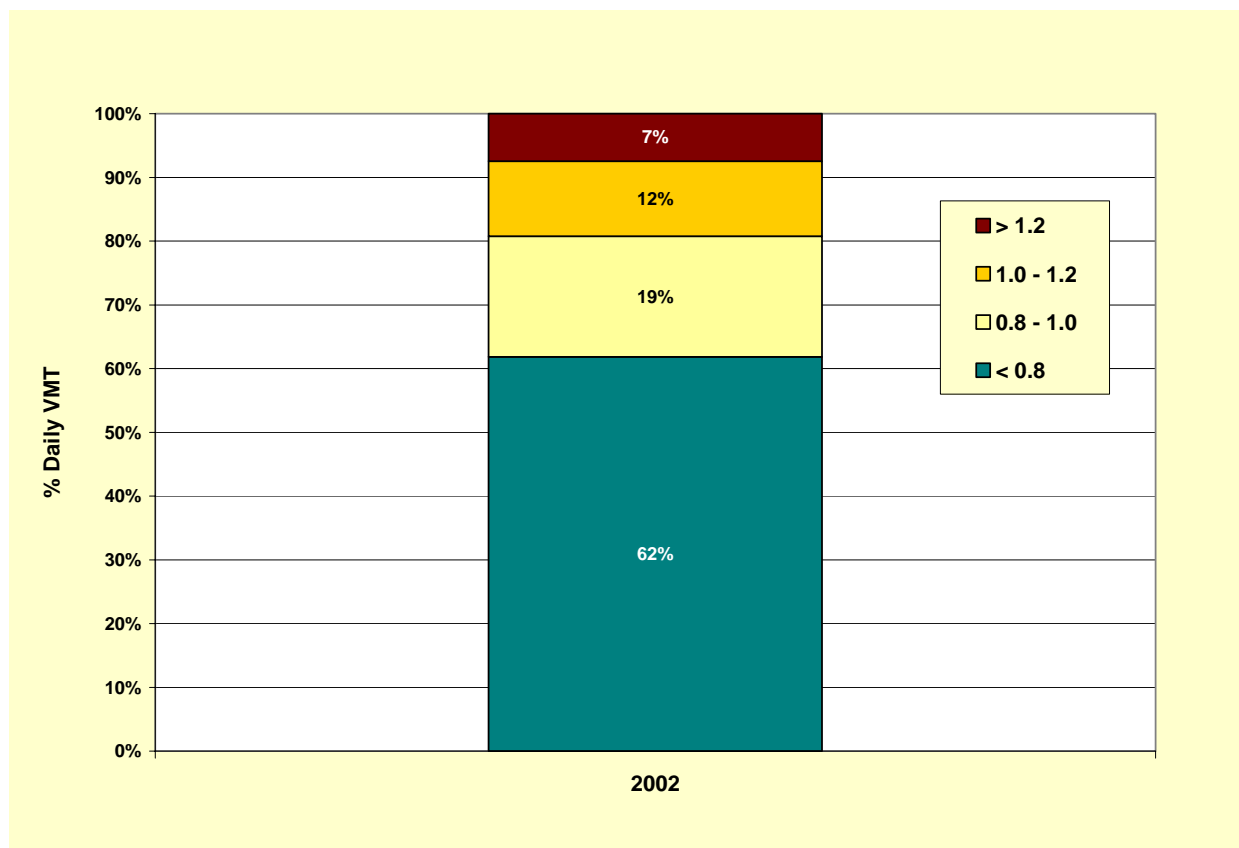


Figure 2.7 — 2002 VMT by V/C Ratio by Functional Class

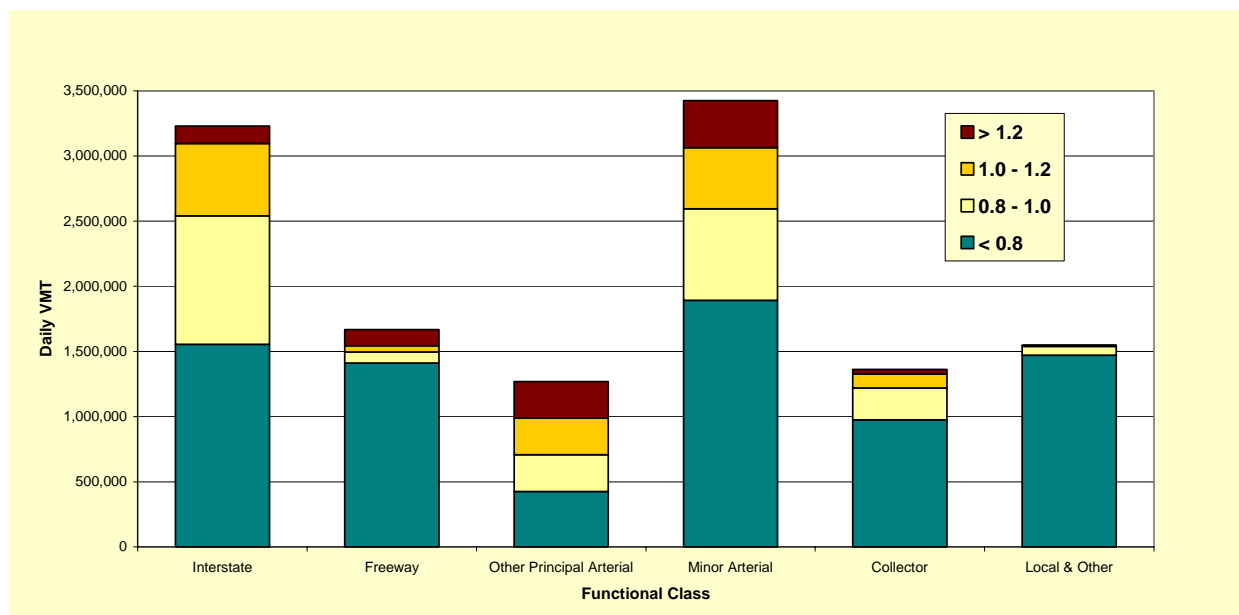


Figure 2.8 — 2002 Congested VMT by Functional Class

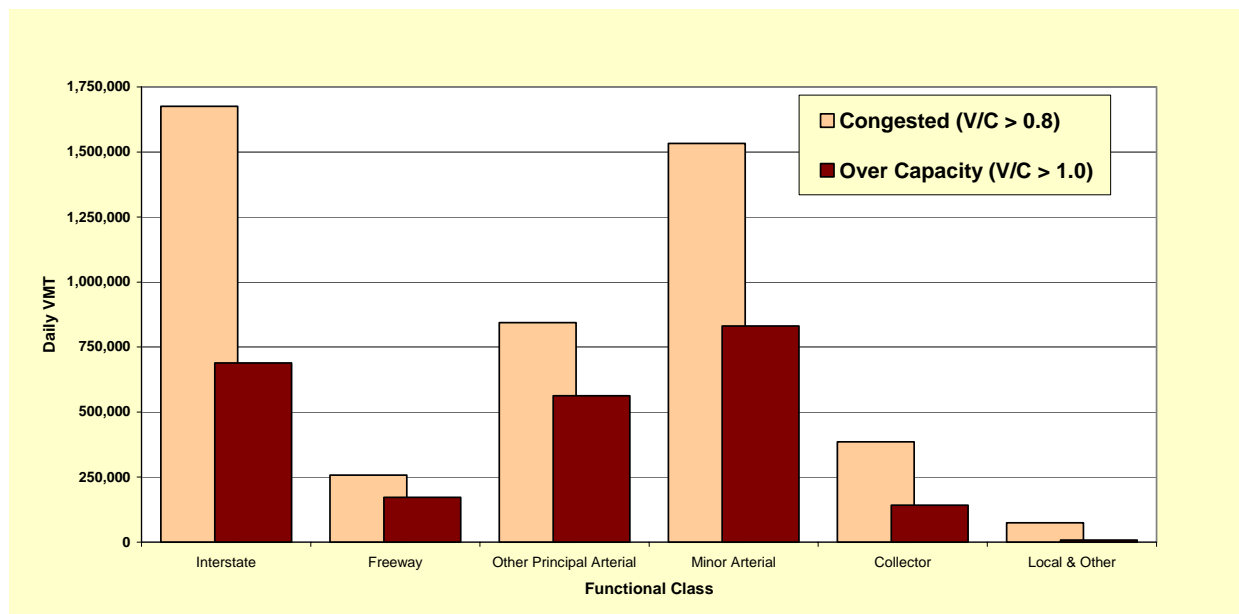


Figure 2.9 — 2002 Percent Congested VMT by Functional Class

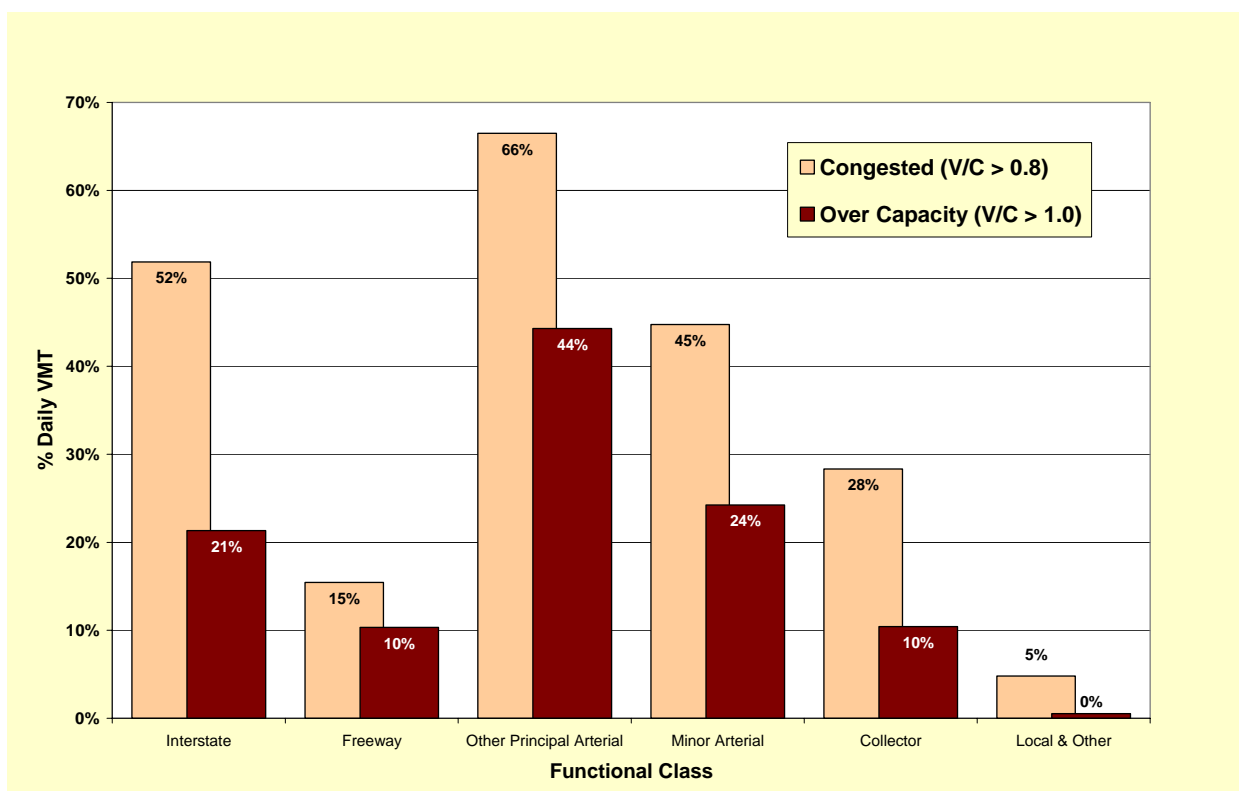


Table 2.3 — 2002 Vehicle Miles Traveled by V/C Ratio

Functional Class	V/C Ratio			
	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2
Interstate	1,555,000	986,000	555,000	134,000
Freeway	1,411,000	85,000	47,000	125,000
Other Principal Arterial	425,000	281,000	283,000	279,000
Minor Arterial	1,893,000	702,000	470,000	367,000
Collector	976,000	244,000	109,000	33,000
Local & Other	1,472,000	66,000	7,000	2,000
TOTAL	7,732,000	2,365,000	1,471,000	933,000

Table 2.4 — 2002 Lane-Miles by V/C Ratio

Functional Class	V/C Ratio			
	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2
Interstate	166	74	32	8
Freeway	252	8	6	14
Other Principal Arterial	101	41	36	29
Minor Arterial	623	106	63	38
Collector	454	39	14	3
Local & Other	509	6	1	0
TOTAL	2,106	274	151	93

Table 2.5 — 2002 Vehicle Miles Traveled Breakdown by Functional Class

Functional Class	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2
Interstate	20.1%	41.7%	37.7%	14.4%
Freeway	18.2%	3.6%	3.2%	13.4%
Other Principal Arterial	5.5%	11.9%	19.2%	29.9%
Minor Arterial	24.5%	29.7%	32.0%	38.7%
Collector	12.6%	10.3%	7.4%	3.5%
Local & Other	19.0%	2.8%	0.5%	0.2%
TOTAL	100.0%	100.0%	100.0%	100.0%

Table 2.6 — 2002 Lane-Mile Breakdown by Functional Class

Functional Class	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2
Interstate	7.9%	27.1%	21.2%	9.2%
Freeway	12.0%	3.0%	3.7%	14.8%
Other Principal Arterial	4.8%	15.0%	23.8%	31.6%
Minor Arterial	29.6%	38.5%	41.5%	40.8%
Collector	21.6%	14.4%	9.3%	3.5%
Local & Other	24.2%	2.1%	0.5%	0.2%
TOTAL	100.0%	100.0%	100.0%	100.0%

Table 2.7 — 2002 Vehicle Miles Traveled Breakdown by V/C Ratio

Functional Class	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2	TOTAL
Interstate	48.1%	30.5%	17.2%	4.2%	100.0%
Freeway	84.6%	5.1%	2.8%	7.5%	100.0%
Other Principal Arterial	33.5%	22.2%	22.3%	22.0%	100.0%
Minor Arterial	55.3%	20.5%	13.7%	10.5%	100.0%
Collector	71.7%	17.9%	8.0%	2.4%	100.0%
Local & Other	95.2%	4.3%	0.4%	0.1%	100.0%

Table 2.8 — 2002 Lane-Mile Breakdown by V/C Ratio

Functional Class	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2	TOTAL
Interstate	59.1%	26.5%	11.4%	3.0%	100.0%
Freeway	90.2%	2.9%	2.0%	4.9%	100.0%
Other Principal Arterial	48.8%	19.8%	17.2%	14.1%	100.0%
Minor Arterial	75.2%	12.7%	7.6%	4.6%	100.0%
Collector	88.9%	7.7%	2.8%	0.6%	100.0%
Local & Other	98.7%	1.1%	0.2%	0.0%	100.0%

Table 2.9 — 2002 Percentage of All Vehicle Miles Traveled by V/C Ratio & Functional Class

Functional Class	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2	TOTAL
Interstate	12.4%	7.9%	4.4%	1.1%	25.8%
Freeway	11.3%	0.7%	0.4%	1.0%	13.3%
Other Principal Arterial	3.4%	2.3%	2.3%	2.2%	10.2%
Minor Arterial	15.1%	5.6%	3.8%	2.9%	27.4%
Collector	7.8%	2.0%	0.9%	0.3%	10.9%
Local & Other	11.8%	0.5%	0.1%	0.0%	12.4%
TOTAL	61.9%	18.9%	11.8%	7.5%	100.0%

Table 2.10 — 2002 Percentage of All Lane-Miles by V/C Ratio and Functional Class

Functional Class	< 0.8	0.8 - 1.0	1.0 - 1.2	> 1.2	TOTAL
Interstate	6.3%	2.8%	1.2%	0.3%	10.7%
Freeway	9.6%	0.3%	0.2%	0.5%	10.7%
Other Principal Arterial	3.9%	1.6%	1.4%	1.1%	7.9%
Minor Arterial	23.7%	4.0%	2.4%	1.4%	31.6%
Collector	17.3%	1.5%	0.5%	0.1%	19.5%
Local & Other	19.4%	0.2%	0.0%	0.0%	19.7%
TOTAL	80.3%	10.5%	5.7%	3.5%	100.0%

Traffic Safety

The traffic safety program for the urban area includes cooperation between NCDOT and the City of Greensboro Department of Transportation. The NCDOT Division 7 Traffic Engineer manages a spot safety program which seeks to alleviate hazardous traffic conditions through targeted improvements. In addition, the Safety Evaluation Section of NCDOT conducts engineering evaluations of completed safety projects and programs to determine their effectiveness in reducing the frequency and severity of motor vehicle crashes, the improvement in mobility, and to provide engineering tools to better understand the effects of safety projects and programs.

While NCDOT remains focused on state maintained sections of roadways, the City of Greensboro Department of Transportation conducts an annual traffic safety program for streets within the City limits. The following information includes excerpts from their 2003 Traffic Safety Program Report. The purpose of the program is to identify locations within the City limits that experience unusual accident activity, which includes accident patterns that occur on a frequent basis or accidents that result in serious or fatal injuries.

This program considers the following in determining hazardous locations: Severity Index, Equivalent Property Damage Only Rate, Fatal Crash Analysis, and Request for Service. The Request for Service program involves reports from citizens that report potential traffic hazards. Each request is investigated and evaluated for possible improvements.

The 2003 Traffic Safety Program utilized the Traffic Engineering Accident Analysis System (TEAAS), which is maintained by the North Carolina Department of Motor Vehicles (NCDMV). The criteria for this query included intersections with a minimum of 5 accidents within 100 feet of the intersection for the period June 1, 2001 to May 31, 2002. Twenty-five intersections were selected for the Severity Index list.

The Equivalent Property Damage Only Rate (EPDOR) is calculated using the Accident Rate (AR) and the Severity Index (SI) for each intersection. The Accident Rate (AR) is based on the number of accidents per million vehicles entering the intersection. The EPDOR is used because the frequency of accidents, accident rate, number and severity of injuries, and the volume of traffic are all considered. Twenty-five intersections were selected for the EPDOR list. Several intersections that made the EPDOR list also made the SI list.

The combination of the Severity Index and Equivalent Property Damage Only Rate resulted in a list 41 intersections that were included in the 2003 Traffic Safety Program. **Table 2.11** depicts these projects as well as proposed improvements intended to enhance safety.

Table 2.11 — Greensboro Safety Program Improvements List

Intersection/Location		Recommended Improvements
Completed Improvement Projects		
*	High Point Road & Pinecroft Road	Mast arm installation/signal reconfiguration project (2004) Re-stripe stop bar for northbound Pinecroft Road (Spring 2004)
*	Colby Street/Oakwood Drive & High Point Road	Re-stripe crosswalk and stop bar for Oakwood Drive (Spring 2004)
*	Battleground Avenue & Cotswold Terrace	Install northbound Battleground Avenue left turn phase (2004)
*	Benjamin Parkway & N. Elam Avenue	Signal modification for northbound Benjamin Parkway (change from lag to lead) (Spring 2004)
**	Park Avenue & Sullivan Street	Install 'Stop Ahead' sign for southbound park Avenue (Winter 2003) Change flasher operation to 'Wig-Wag' (Winter 2003) Re-Stripe stop bar for southbound Park Avenue (Spring 2004)
**	Apache Street & S. English Street	Install 'Stop Ahead' sign for Apache Street (Winter 2003) Re-stripe stop bar for Apache Street (Spring 2004)
**	Frazier Road & Groometown Road	Investigate signalization (Winter 2003) Replace existing chevrons with oversize chevrons (Winter 2003)
	Phillips Avenue	Install crosswalks, pedestrian refuge islands, crosswalk signs with continuous flasher, and reduce speed limit (Spring 2004)
	S. Eugene Street & W. Sycamore Street	Install 'in-street' pedestrian signs and rumble strips (Winter 2003)
	W. Market Street & Commerce Place	Install 'in-street' pedestrian signs and rumble strips (Spring 2004)
	Hobbs Road (1400 Block)	Installed 'chevron' signs (Winter 2003)
	Center Street (Hunter Elementary School)	School Zone Flasher (Winter 2003)
	Martin Luther King Jr. Drive (Gillespie Elementary School)	School Zone Flasher (Winter 2003)
	Elm Street & Fisher Avenue	Install 'in-street' pedestrian signs (Winter 2003)
	Elam Avenue between W. Friendly Avenue & Benjamin Parkway	Install pedestrian refuge islands/mid-block crosswalk (Winter 2003)
	W. Friendly Avenue & College Road/New Garden Road	Installation of signs indicating "Turning Traffic Must Yield to Pedestrians" (Fall 2003)
	Center Street & Larson Street	Installation of pedestrian crosswalk (Fall 2003)
	Virginia Street & W. Wendover Avenue	Install intersection warning signs with continuous flasher (Winter 2003)
	Fourth Street & Summit Avenue	Signal installation (Winter 2003)
	Lawndale Drive & New Garden Road	Removal of sight obstruction (Winter 2003)
	Wendover Avenue (I-40 to Meadowood Street)	Median installation (Winter 2003)

*Greensboro Urban Area
2030 Long Range Transportation Plan*

Intersection/Location		Recommended Improvements
	Walker Avenue	Install multi-way stops, pedestrian crosswalks, and rumble strips (Spring 2004)
Improvement Projects Planned or Under Way		
*	W. Friendly Avenue & Green Valley Road	Install "Left Turn Yield on (Green Ball)" sign for eastbound W. Friendly Avenue
*	English Street & E. Market Street	Install "Left Turn Yield on (Green Ball)" sign for northbound English Street and eastbound E. Market Street
*	Chimney Rock Road & W. Friendly Avenue	Re-stripe stop bars on Chimney Rock Road (Spring 2004)
*	Randleman Road & South Street/Orchard Street	Investigate installation of flasher for northbound Randleman Road at South Street (Spring 2004)
*	High Point Road & Vanstory	Install back plates on High Point Road Signals (Spring 2004)
*	Battleground Avenue & Brassfield Road	Intersection Improvement Project Re-stripe for all approaches (Spring 2004)
*	Lindsay Street & Murrow Boulevard	Offset left turn lanes for Murrow Boulevard (Prepare Functional-Winter 2003)
*	Cone Boulevard & N. Elm Street	Re-stripe stop bars for Cone Boulevard
*	Battleground Avenue & Battleground Court/Mill Street	Install northbound Battleground Avenue left turn phase (2004)
*	E. Friendly Avenue & N. Murrow Boulevard	Signal reconfiguration with the Market Street streetscape project
*	Battleground Avenue & W. Cone Boulevard/Benjamin Parkway	Intersection Improvement Project
**	E. Bessemer Avenue & E. Lindsay Street	Re-stripe stop bars and crosswalks (Spring 2004)
**	W. Florida Street & McCormick Street	Install stop bars on McCormick Street (Spring 2004)
**	Sullivan Street & Summit Avenue	Check left turn warrants for southbound Summit Avenue (Winter 2003)
**	Creek Ridge Road & Randleman Road	Re-Stripe stop bar for eastbound Creek Ridge Road (Spring 2004)
	Lees Chapel Road & Southern Webbing Mill Road	Actuated Flasher Installation (Fall 2003)
	Pisgah Church Road & Ransom Road	Installation of pedestrian crosswalk (Fall 2003)
	Huffine Mill Road & Esquire Court	Removal of sight obstruction (Winter 2003)
	Elm Street & Willoughby Boulevard	Installation of 'curve warning' sign (Winter 2003)
	Lee Street & Tate Street	Installation of 'No U-Turn' sign (Summer 2003)
* - Intersection Identified by Severity Index ** - Intersection Identified by EPDOR		

Future Roadway and Highway Conditions

Background

The Greensboro area has experienced sustained growth over the past several decades, even more so than the Triad region as a whole. This growth is expected to continue over the next 25 years, although at a somewhat slower pace. Population inside the MPO boundary grew from 292,000 in 2000 to an estimated 315,000 in 2004. This population is expected to be 372,000 in 2014; 401,000 in 2020; and 449,000 by 2030.

Employment within the Greensboro MPO planning area is expected to grow at a slightly faster pace than in recent years, although at a slightly slower rate than population, overall. The estimated employment total in 2000 was 193,000. Today it is approximately 203,000. Forecasts predict employment levels of 227,000 by 2014; 244,000 by 2020; and 274,000 in 2030.

Future Roadway Conditions

During the period from 2002 through 2030, traffic in the Greensboro MPO is expected to grow at a faster rate than population (a 55% increase in vehicle miles traveled (VMT), versus 48% growth in population). Over the same time period, lane-miles will increase by only 15% over existing conditions, based on construction of committed highway projects.

This “existing plus committed” or “E+C” network serves as the baseline for evaluating future travel conditions. It represents those state and City transportation projects which can reasonably be assumed complete by 2030, as demonstrated by existing financial commitments in the TIP and CIP, and based on the status of planning, environmental documentation, design, and construction for each project.

The E+C network adds approximately 400 lane-miles to the current roadway network. Two-thirds of this mileage is freeway construction, mainly associated with completion of the Urban Loop and I-40 widening projects, plus construction of the NC 68/ US 220 connector (Future I-73). Most of the remaining lane-miles are associated with arterial widenings. The effects of transit and other non-automobile modes, as well as travel-demand strategies, are assumed to remain proportionate to today's levels.

Although the capacity improvements associated with the E+C network will provide significant congestion relief and other benefits, these benefits will not be enough to offset all the traffic growth anticipated through 2030. Overall, conditions will probably be better than they are now for a period between 2010 and 2020, depending on project completion schedules and actual growth patterns. But by 2020, conditions are expected to have degraded significantly. Problems will be most noticeable west of downtown and in the airport area. I-40 will again become congested, as will parallel arterials like West Market Street and Friendly Avenue. NC 68 will remain a bottleneck, and conditions will deteriorate on Wendover Avenue, High Point Road, Holden Road, and Guilford College Road. US 29 north, US 220 north, Battleground Avenue, and Benjamin Parkway all will experience significant congestion. Even northwestern portions of the Urban Loop will see decreases in level of service.

A complete list of key facilities expected to experience high levels of delay and heavily congested peak-hour conditions follows:

- I-40 from Patterson Street to Forsyth County line
- Friendly Avenue from Wendover Avenue to Market Street
- Market Street from Holden Road to Bunker Hill Road (in Colfax)
- Wendover Avenue from Bridford Parkway to Spring Garden Street; from Friendly Street to US 29
- Spring Garden from Spring Street to Market Street
- Lee Street from Patterson Street to Edward R. Murrow Boulevard
- Holden Road from US 220/Battleground Avenue to West Meadowview Road
- Guilford College Road from Friendly Avenue to I-40
- New Garden Road from Fleming Road to Friendly Avenue
- Elm Street from Willoughby Boulevard to Bessemer Avenue
- NC 68 from Rockingham County line to southern MPO boundary (adjacent to High Point)
- Pinecroft Road from High Point Road to Vandalia Road
- Vandalia Road from Groometown Road to I-85
- Alamance Church Road from the Urban Loop to Southeast School Road
- Creek Ridge Road from Randleman Road to Spring Road
- US 70 from Penry Road to Birch Creek Road
- Battleground Avenue from Cornwallis to Wendover; from Horse Pen Creek Road to US 220-NC 68 Connector
- Aycock Street from Friendly Avenue to Florida Street
- Lovett Street from Florida Street to Freeman Mill Road
- Freeman Mill Road from Lovett Street to I-40

- Lawndale Drive from Lake Jeannette Road to Pisgah Church Road
- Martinsville Road from Lawndale Drive to US 220/Battleground Avenue
- Cone Boulevard from US 220/Battleground Avenue to Church Street
- Martin Luther King, Jr. Drive from Lee Street to I-40
- Hicone Road from US 29 to Hines Chapel Road
- Church Street from Fisher Avenue to Pisgah Church Road
- Urban Loop from Bryan Boulevard to Lawndale Drive

More general observations about future conditions include the following:

- Most of the system-level benefits from the E+C improvements are attributable to the substantial amount of freeway construction. This causes a shift in the largest share of future VMT deficiencies from freeways to surface streets, especially minor arterials. As the area continues to urbanize, these “workhorse” facilities will become more and more important, especially in terms of lane-miles and system maintenance responsibilities (state versus City). They also serve as the backbone of an effective local public transit system. In addition, the effectiveness of the freeway system depends greatly on the network of surface streets that provide access. Freeway capacity is compromised if traffic cannot get on or off of the freeway due to congested arterials, especially at key interchanges.
- Capacity improvements should focus on eliminating choke points and filling in “missing links.” Many of these types of deficiencies result from the lack of direct and convenient cross-town traffic service, especially in the east-west direction. Without appropriate improvements, traffic will be forced to use indirect routes, zigzagging on radial and circumferential facilities, cutting through on neighborhoods on local streets, and using up freeway and interchange capacity for short trips. Adequate cross-town arterials also will be important for efficient and reliable future transit service expansion.
- Given the expense and difficulty of further roadway construction and widening, every effort should be made to maximize operational efficiency and manage the demand for automobile travel. The new ***Greensboro Urban Area Congestion Management System (CMS)*** provides an effective tool for accomplishing this task. The CMS identifies a continuous program of data collection and management, performance monitoring, traffic demand reduction, and traffic operation improvements. Elements of the CMS include:

- *Data Collection and System Monitoring* – Conduct surveys and studies of traffic volumes, vehicle occupancy rates, travel speeds, time-of-day characteristics, level of service/travel delay, pedestrian volumes, transit use, etc.
- *Alternative Modes* – Encourage the use of alternative modes (walking, bicycling, and transit)
- *Vehicle Occupancy* – Promote higher vehicle occupancy rates through various ridesharing programs (including vanpools, rideshare matching, guaranteed ride home, park-and-ride/kiss-and-ride lots, etc.)
- *Travel Demand Management* – Reduce demand for roadway capacity by such means as flexible working hours, telecommuting, strategic parking policies, more efficient mixed-use development patterns, etc.
- *Signal Systems/ITS* – Maximize efficiency of the existing roadway network by coordinating and optimizing traffic signals and employing surveillance cameras, variable message boards (and other traveler information systems) to deal with both recurring congestion and non-recurring incidents.

By coordinating these components of the CMS, and integrating them into the LRTP, available capacity (or infrastructure investments) can be preserved and used as effectively as possible. Typically, recommendations from the CMS are intended for implementation over the next 1-to-10 years. To ensure the timely consideration of all non-construction alternatives, any congestion problem addressed by a project in the Recommended LRTP should already have been identified in the CMS.

- The high percentage of truck and through traffic on major freeways constrains the potential benefits of transit improvements and travel demand reduction on these facilities. Additional planning for freight movement is recommended.
- Although not the largest problem in terms of total VMT or delay, the urbanization of fringe areas will trigger significant relative increases in traffic volumes on two-lane rural and local roads. Typically, the widespread and sometimes dramatic nature of these changes will lead to the perception of a problem that is out of proportion to its actual impacts.

System-Level Performance Measures: E+C

Prior to analyzing possible future year scenarios, it is helpful to establish a baseline for the more quantitative measures of effectiveness (MOE). As in the analysis of the existing conditions, all statistics given below are based on the Piedmont Triad Regional Travel Demand Model (PTRTDM), and are reported for the Greensboro Urban Area.

Table 3.1 summarizes the changes in VMT between the base year and the future year E+C networks. Most notable is the significant increase in VMT on freeways. This is not wholly surprising, however, given the substantial increase in freeway lane-miles, including construction of the Urban Loop and the NC 68-220 Connector, plus completion of the I-40/US 421 widening.

Table 3.1 — Daily Vehicle Miles of Travel

Functional Class	2002	2030 E+C	% Increase
Freeway	4,898,000	8,439,000	72%
Arterial	4,695,000	6,385,000	36%
Collector	2,908,000	4,544,000	56%
TOTAL	12,500,000	19,368,000	55%

The vehicle hours of travel (VHT) for both 2002 and 2030 E+C are summarized in **Table 3.2**. In general, the increases follow the same pattern as with the changes in VMT. Unfortunately, the percent growth in VHT exceeds that in VMT for all functional classes. The “average speed” by functional class will decrease over the planning horizon. This decrease can be seen in **Table 3.3**.

Table 3.2 — Daily Vehicle Hours of Travel

Functional Class	2002	2030 E+C	% Increase
Freeway	100,400	183,600	83%
Arterial	119,700	177,500	48%
Collector	77,900	127,000	63%
TOTAL	298,000	488,000	64%

Table 3.3 — Daily “Average Speeds” (VMT/VHT)

Functional Class	2002	2030 E+C	% Increase
Freeway	48.8	46.0	-6%
Arterial	39.2	36.0	-8%
Collector	37.3	35.8	-4%
TOTAL	41.9	39.7	-5%

Figures 3.1 and 3.2 graphically depict the relationships between 2002 and 2030 E+C VMT and VHT, by functional class.

Figure 3.1 — 2002 vs. 2030 E+C: Daily VMT by Functional Class

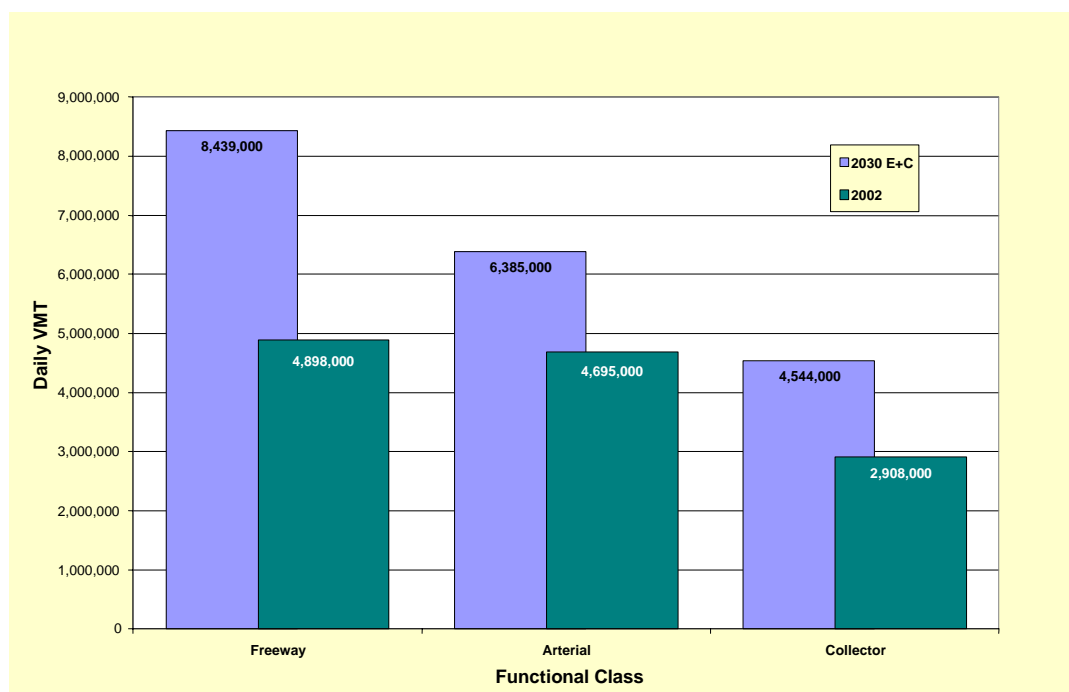
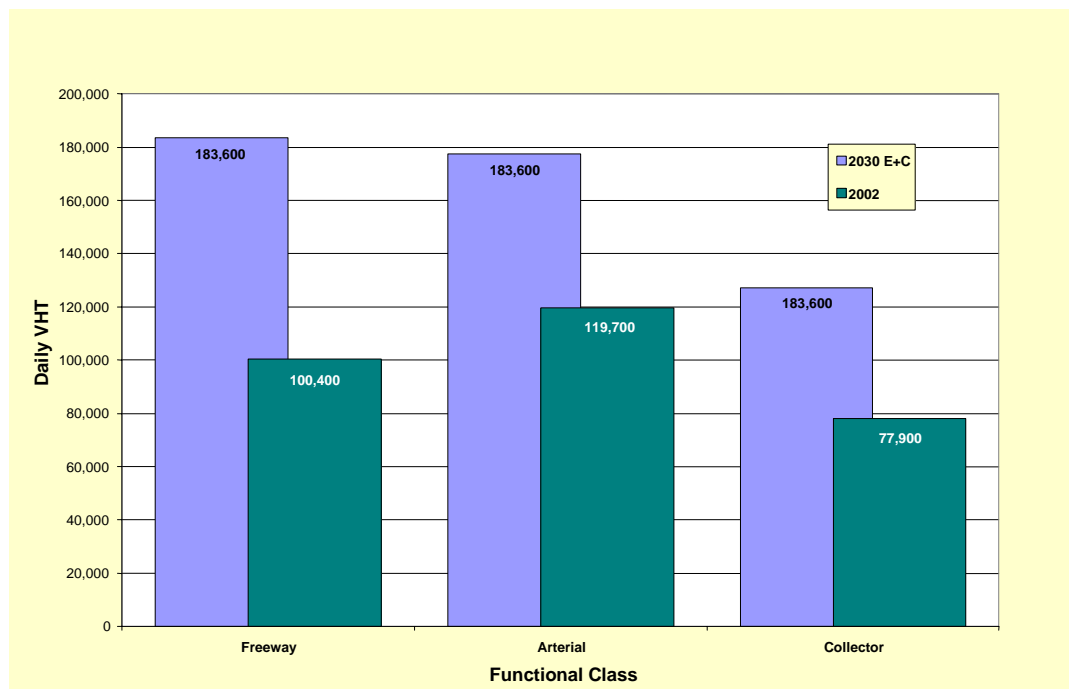


Figure 3.2 — 2002 vs. 2030 E+C: Daily VHT by Functional Class



Alternatives Analysis

Having established the 2030 E+C network as a baseline for assessing the performance of proposed future year solutions, several scenarios were developed. The first two scenarios were intended to represent contrasting strategies for addressing travel deficiencies. By analyzing the differences in their performance (both relative to the E+C network and to each other), it is possible to evaluate the strengths and weaknesses of each approach. The E+C network identifies the critical deficiencies; the different scenarios are assessed on the degree to which they address these deficiencies. Then, consideration is given to the relative costs of each scenario, and to the impacts of each on the natural environment and on existing communities. This analysis also reveals which deficiencies are most amenable to which type of solution, and which are not significantly improved in either case. All of these factors can then be weighed, and through an interactive public involvement process, used to develop a set of final recommendations.

Highway Focus

The first scenario developed for comparison with the E+C baseline was the Highway Focus Scenario. This scenario starts with the

E+C network, and adds roadway capacity at locations experiencing substantial congestion. Public transportation and bicycle and pedestrian improvement programs are maintained at the same level as in the E+C baseline. The strategy behind the Highway Focus Scenario is to assess the effectiveness of liberally increasing roadway capacity in an attempt to reduce congestion. In order to fully realize this objective, environmental and community impacts were not considered in project selection; the only criteria were the potential to improve traffic flow and reduce delay. For example, widenings are proposed for such highly-urbanized facilities as Friendly Avenue and Market Street, even though these corridors are heavily developed and would be seriously disrupted by widening projects. Capacity is not considered to be unbounded, however. Arterials are limited to six through lanes, and freeways constrained to eight.

Under this scenario, just fewer than 250 lane-miles are added to the E+C network. Most of these additions (about 140 lane-miles) are to the arterial system, mainly existing facilities that are widened, and missing links that are filled in. The remainder of the new capacity is divided nearly equally between freeways and collectors/locals. Most of the projects in the western portion of the study area are new freeways and arterial widenings. In other areas, construction of missing arterial links dominates.

This scenario results in less congestion than the E+C network, but does not eliminate it. Many areas exhibiting moderate congestion in the E+C analysis receive no significant relief from the Highway Focus Scenario, since this strategy focuses heavily on the most congested locations. Moreover, because of its emphasis on increasing capacity (with no corresponding goal to improve accessibility or connectivity), this scenario provides very few desirable alternatives to driving on congested facilities that have already reached their capacity limits.

Alternative Focus

The second scenario focuses on alternatives to highways and the single-occupancy vehicle. It is intended to explore the potential benefits of increased transit use, higher vehicle occupancy rates, pedestrian-friendly design, and travel demand management programs in the absence of added roadway capacity. This would be accomplished through increased transit service, as well as travel demand management through ride-sharing programs and other incentives.

Since the existing travel demand model lacks the ability to predict transit ridership, pedestrian trips, travel demand management programs, or other strategies just listed, it was decided to assume an ambitious set of programs were in place to reduce automobile

travel, by encouraging transit and pedestrian travel, increasing vehicle occupancy, and implementing travel demand management strategies. Automobile trip reductions consistent with these assumptions were estimated, and these trips were then removed from the vehicle-trips assigned to the network in the E+C baseline (and Highway Focus Scenario). While no specific routes, services, or modes are identified (i.e., the proposed PART regional rail service), the Alternative Focus Scenario assumes very high levels of transit use, well beyond the ridership associated with any local or regional transit system currently proposed.

The effects of the assumptions in this scenario are concentrated in the urbanized area of Greensboro likely to be served by transit in 2030. This area consists of the most densely developed traffic analysis zones (TAZs) in the urban area, containing a mixture of residential and non-residential land uses. Similarly, the network of streets and sidewalks serving these zones is the most suitable to pedestrian activity and transit operations, relative to other parts of the urbanized area. This area of future transit service is assumed to include 230 of the 554 traffic analysis zones in the model study area, containing more than 124,000 households (286,000 persons) in 2030.

Within the area defined above, an additional 10 percent of all home-based work (HBW), 8 percent of all home-based other (HBO), and 3 percent of all non-home based (NHB) trips are assumed to take transit, rather than driving. The result is just over 100,000 transit trips per day (~130,000 unlinked transit trips) within the MPO boundary. This translates into a transit mode share of approximately 10% (or nearly one transit trip per household each day).

For zones in the Greensboro area assumed not served by transit under this scenario, a 2 percent increase in vehicle occupancy for HBW trips was assumed. This increase results from ridesharing and park-and-ride programs, and translates to the elimination of another 11,300 vehicle trips. No changes were assumed for zones outside the MPO boundary. However, another 30,000 vehicle-trip reduction within the urban area is attributed to non-transit modes, land use changes, and related travel demand management strategies. In all, 114,300 vehicle trips (out of about 2 million in the MPO model area) were eliminated under this scenario.

L RTP

The Recommended L RTP resulted from the evaluation of the two scenarios described above, combined with input from the public involvement process. The Recommended L RTP builds on the projects in the 2030 E+C network, as well as the previous L RTP. It represents an attempt to improve accessibility and reduce traffic

congestion, while recognizing the limitations of expanding roadway capacity. While assumptions regarding transit, ride-sharing, or travel demand management are the same as those in the E+C baseline, roadway improvement projects in the Recommended LRTP are fiscally constrained, and reflect attempts to minimize negative environmental and community impacts. Careful consideration is also given to the logical staging and programming of projects, in order to maximize efficiency and cost effectiveness, while minimizing disruptions.

The Recommended LRTP does not include many of the major arterial widenings proposed in the Highway Focus Scenario. These projects were deemed prohibitively expensive and disruptive, and therefore not feasible. The Recommended LRTP also differs from the Highway Focus Scenario in more subtle ways, emphasizing only those improvements that best address the community's most critical travel needs. Projects with the potential to create new problems (such as generate additional VMT, congestion, or delay) were eliminated or modified. There are actually a few more lane-miles of freeway in the Recommended LRTP than in the Highway Focus Scenario, the result of slight refinements to the Airport and I-40/I-73/NC 68 Connectors. Interchange locations and configurations along US-421 south also were modified. Several cross-town arterial connections and "missing links" were eliminated, added, or altered, especially on the southern and eastern sides of Greensboro. Overall, the Recommended LRTP adds just over 200 lane-miles to the E+C network (versus nearly 250 lane-miles added in the Highway Focus Scenario).

Comparisons of Scenarios

Tables 3.4 through 3.6 summarize the Measures of Effectiveness (MOE) results for each of the scenarios by functional class. An analysis of the VMT reveals few surprises. The Highway Focus Scenario, as well as the LRTP, results in an increase in VMT over the 2030 E+C baseline; given the significant expansion of lane-miles, this is not surprising. Nor is it surprising that the Alternative Focus Scenario reduces VMT, in comparison with the E+C. In all cases, however, the total daily VMT falls within 1.5 percent of the E+C network, a relatively minor difference.

One item of note is that, of all the scenarios, the Recommended LRTP has the lowest VMT for non-freeway roads, and the highest freeway VMT. Although the Recommended LRTP includes only a modest increase in freeway lane-miles over the E+C, these significantly improve connectivity and allow for greater utilization of existing capacity. The resulting higher travel speeds have the effect of diverting traffic away from lower classification roadways.

Table 3.4 — Comparison of 2030 Alternatives - Daily Vehicle Miles of Travel

VMT	E+C	Recommended LRTP	Highway Focus	Alternative Focus
Freeway	8,744,000	9,085,000	8,879,000	8,667,000
Arterial	6,296,000	6,184,000	6,440,000	6,175,000
Other	4,533,000	4,346,000	4,297,000	4,445,000
TOTAL	19,573,000	19,615,000	19,616,000	19,287,000

The Recommended LRTP also has the lowest VHT of all the scenarios, although by only a slight margin. On the surface, this finding may seem surprising; it would probably be assumed that the Highway Focus Scenario, with over 40 additional lane miles (a 22% larger increase), would provide the least congested travel, and the lowest VMT. Although the Highway Focus Scenario provides extra capacity on high-demand arterial corridors, it continues to attract trips to lower-speed facilities that remain congested, despite extensive widening. The Recommended LRTP, on the other hand, avoids crossing this point of diminishing returns, and provides a better fit between capacity and travel demand. This is attributed to the “fine-tuning” of freeway improvements, combined with the elimination of several of the major arterial widening projects from the Highway Focus Scenario. These changes resulted in a more optimal system, with a very efficient freeway network.

Table 3.5 — Comparison of 2030 Alternatives - Daily Vehicle Hours of Travel

VHT	E+C	Recommended LRTP	Highway Focus	Alternative Focus
Freeway	182,000	172,000	174,000	180,000
Arterial	176,000	153,000	167,000	171,000
Other	127,000	117,000	117,000	124,000
TOTAL	485,000	442,000	458,000	475,000

Table 3.6 — Comparison of 2030 Alternatives – Lane-Miles

Total Lane-Miles	E+C	Recommended LRTP	Highway Focus	Alternative Focus
Freeway	826	897	879	826
Arterial	1,131	1,202	1,271	1,131
Other	1,066	1,126	1,119	1,066
TOTAL	3,023	3,225	3,269	3,023

As **Tables 3.7 through 3.9** confirm, the Recommended LRTP does not eliminate as much congestion as the Highway Focus Scenario. But it does keep a larger share of its VMT on freeways (instead of surface streets), maintaining a higher overall travel speed. By any of these level-of-service based measures, however, both the Highway Focus Scenario and Recommended LRTP (and only these two scenarios) provide significant benefits. **Figures 3.3 through 3.6** depict this same information in a graphical format.

Analysis of the various scenarios confirms some earlier findings, and leads to some new ones:

- In terms of functional classification, the bulk of transportation deficiencies will shift from freeways (today) to arterials (by 2030).
- Increasing roadway capacity can reduce congestion, but it can also result in longer (but faster) trips. This can lead to undesirable increases in VMT.
- VMT alone is not an adequate performance measure, however. The level of congestion (VMT occurring in over-capacity conditions, both in absolute and relative terms) and the speeds at which VMT occurs are critical in assessing energy consumption, air quality, and other impacts.
- Traffic management techniques designed to optimize performance and preserve capacity are critical. They can be implemented relatively quickly, and will become even more cost-effective over time, as construction, right-of-way, and mitigation costs continue to escalate.
- Transit and other non-highway modes and strategies can have significant impacts, especially in certain corridors and time periods. However, it is difficult to reduce persistent, large-scale congestion using these techniques alone, because:

- These alternatives tend to affect shorter trips, rather than long ones.
- Traffic will shift in time and location to take advantage of new capacity, whether this capacity is the result of construction, or has been freed up by transit trip reduction programs.

Table 3.7 — Comparison of 2030 Alternatives – Over Capacity VMT

Over-Capacity VMT (v/C >1, directional)	E+C	Recommended L RTP	Highway Focus	Alternative Focus
Freeway	2,551,000	1,423,000	1,249,000	2,402,000
Arterial	2,801,000	2,523,000	1,759,000	2,603,000
Other	678,000	465,000	370,000	643,000
TOTAL	6,030,000	4,411,000	3,378,000	5,648,000

Table 3.8 — Comparison of 2030 Alternatives – Lane-Miles Over Capacity

Lane-Miles Over Capacity (v/C >1, directional)	E+C	Recommended L RTP	Highway Focus	Alternative Focus
Freeway	161	98	80	151
Arterial	313	290	203	294
Other	81	52	44	77
TOTAL	555	440	327	522

Table 3.9 — Comparison of 2030 Alternatives – “Average Speed”

“Average” Speed (VMT/VHT, mph)	E+C	Recommended L RTP	Highway Focus	Alternative Focus
Freeway	48	53	51	48
Arterial	36	40	39	36
Other	36	37	37	36
TOTAL	40	44	43	41

Recommended Roadway Investments

As previously mentioned, the recommended list of projects was developed based on the technical analysis as well as input obtained during the public involvement process. The recommendations also reflect consideration of the revised Thoroughfare Plan discussed in Chapter 5 of this report. The overall roadway investment strategy builds on the projects in the 2030 E+C network with a focus on both increasing accessibility and reducing congestion. The horizon year of the Long Range Transportation Plan is 2030. Nearly all of the connections shown on the Thoroughfare Plan are anticipated to be made by that time. Most of these connections will be made by 2020.

The following are summaries for the recommended roadway investments for each of the horizon years: 2004, 2014, 2020, and 2030. Also, for each horizon year, a table of proposed projects and corresponding maps by horizon years is provided.

Figure 3.3 — Comparison of 2030 Alternatives - Daily Vehicle Miles of Travel

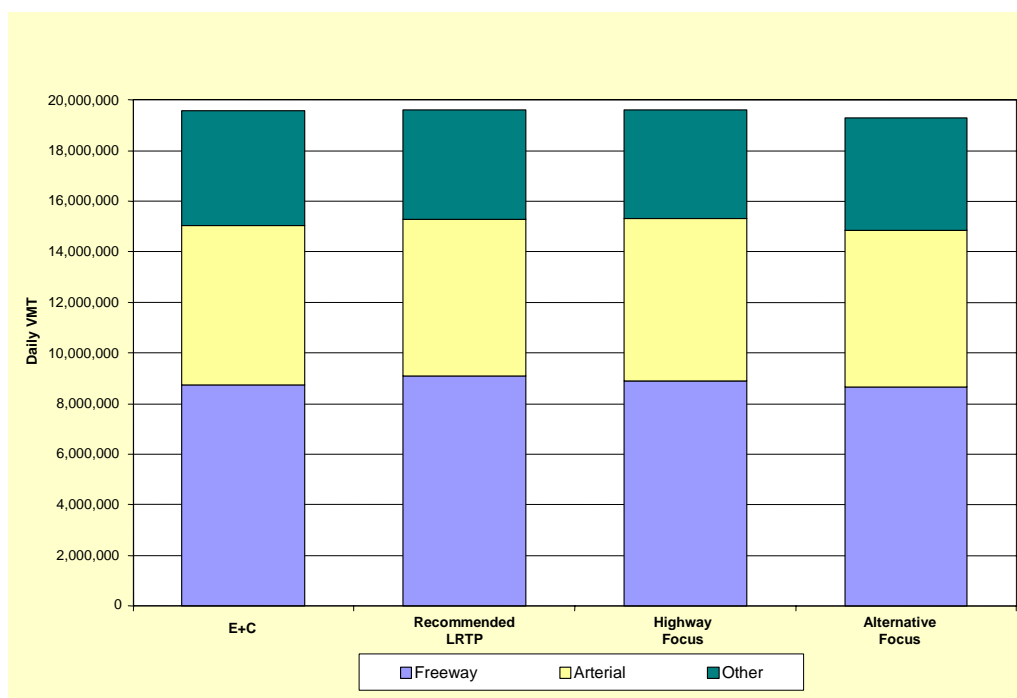


Figure 3.4 — Comparison of 2030 Alternatives - Daily Vehicle Hours of Travel

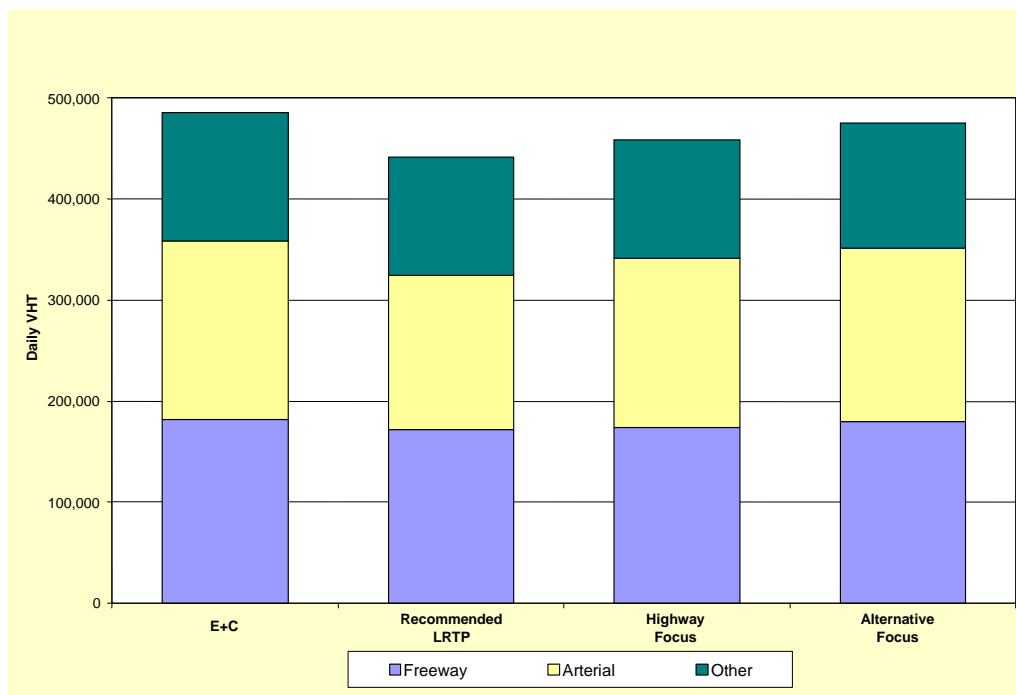


Figure 3.5 — Comparison of 2030 Alternatives – Over Capacity VMT

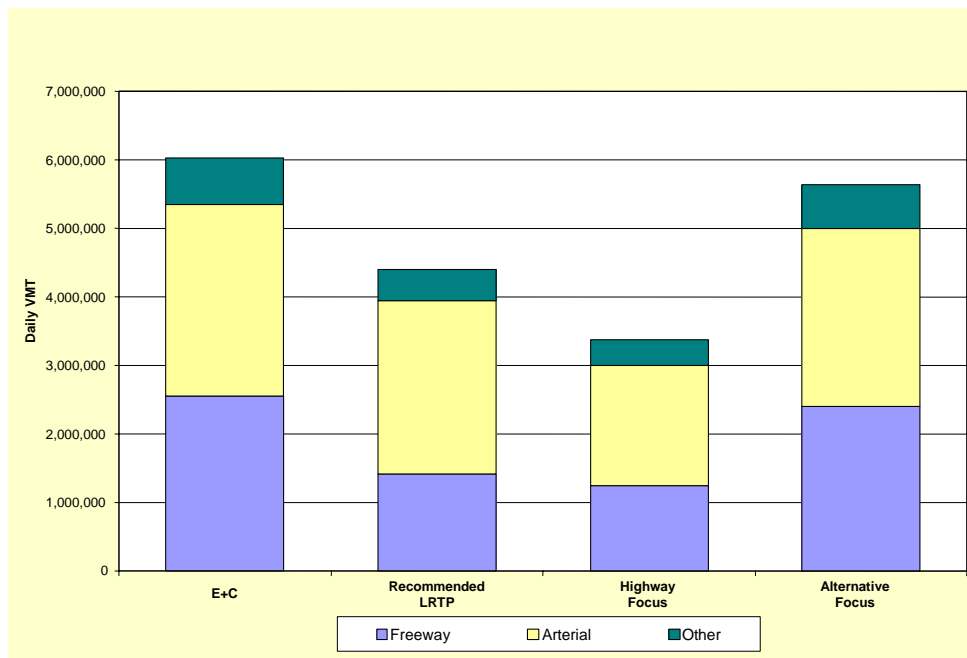
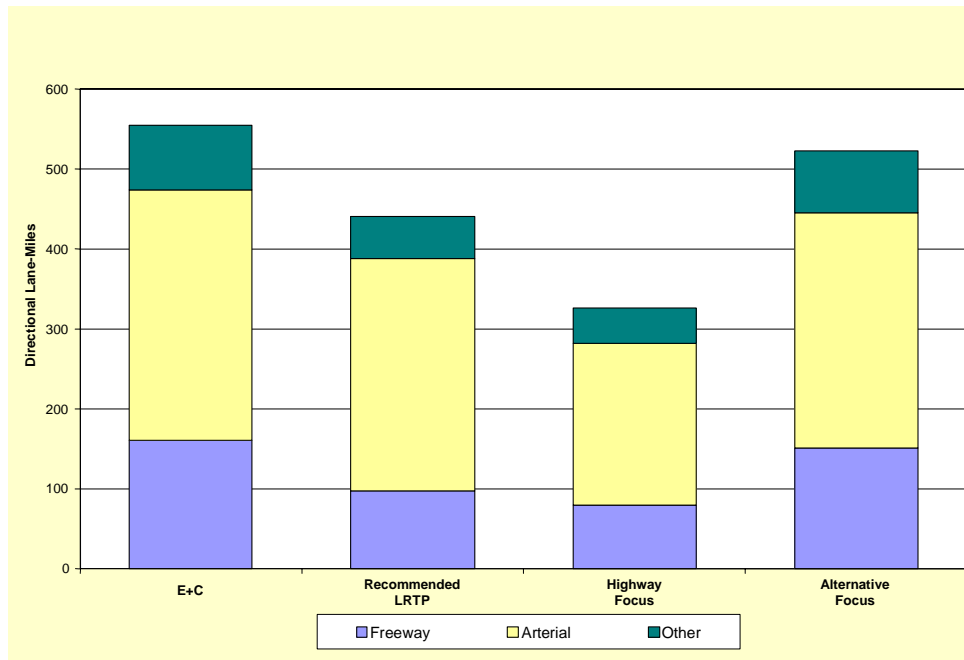


Figure 3.6 — Comparison of 2030 Alternatives – Over Capacity Lane-Miles



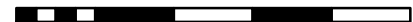
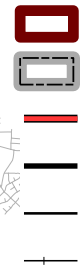
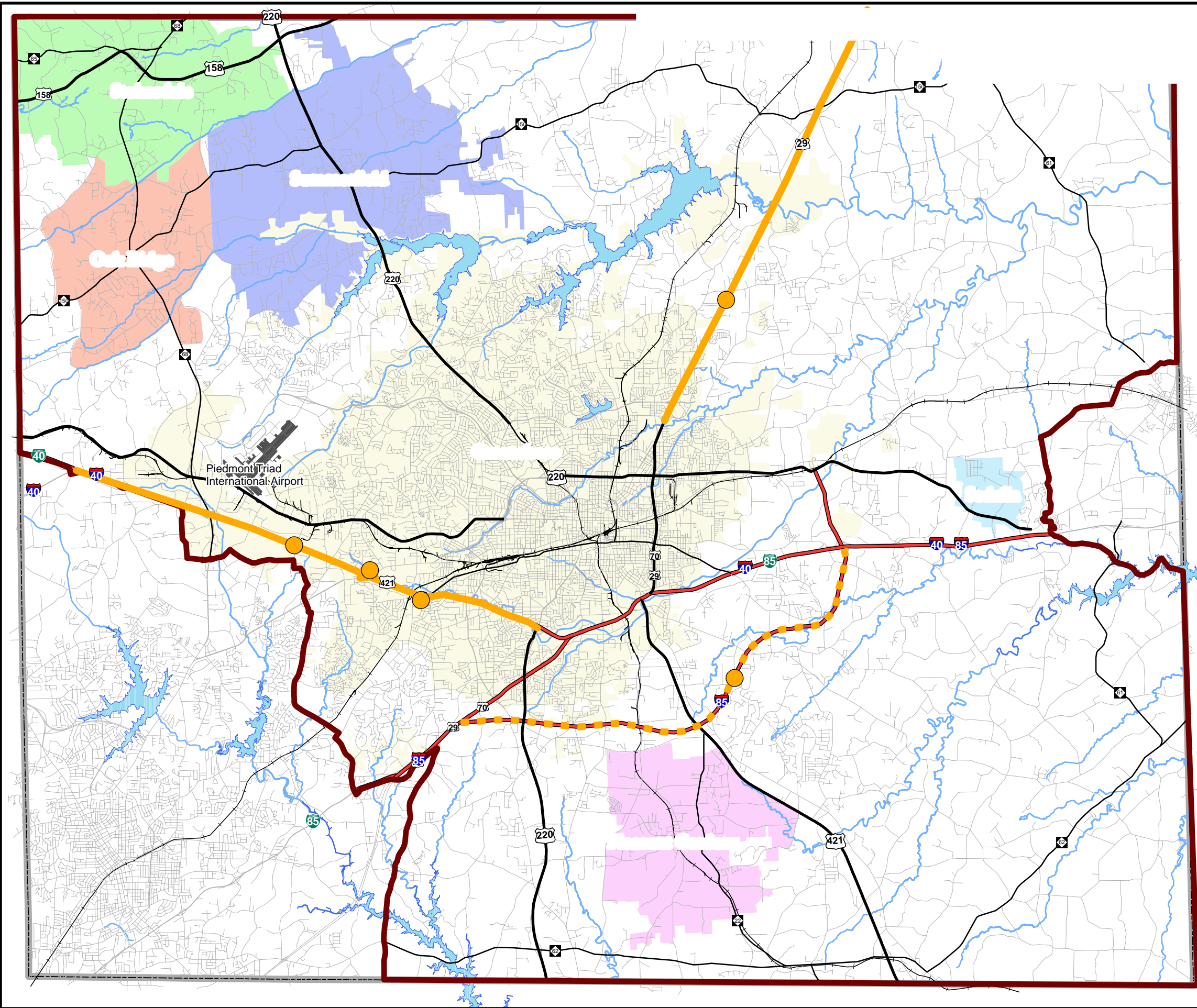
Tables 3.10, 3.11, 3.12, and 3.13 inventory the roadway projects that are expected to be complete in each horizon year. Horizon year project maps depict these projects and are included as **Maps 3.1, 3.2, 3.3, and 3.4**. Additional information regarding project cost a funding can be found in the Financial Element (Chapter 12) of this plan.

2004 –Base Year

This time period reflects the construction of many of the projects scheduled and funded in the state transportation improvement program (TIP), including the completion of the southern portion of the Greensboro Urban Loop.

Table 3.10 — 2004 Base Year Roadway Projects

2004								
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
A1		Wendover Avenue	Big Tree Way to Stanley Rd.	0.4	4 lane	6 lane	Major Arterial	Yes
A2	R-984	US 29	16th St. to Rockingham County line (pavement rehab)	10.9	4 lane divided	4 lane divided	Freeway/Expressway	Yes
A3	I-2402	Southern Urban Loop (I-85)	I-85 to Clapp Farm Rd.	14.7	N/A	6 lane freeway	Interstate	Yes
A4	I-2201	I-40 / US 421	Bus. 40 to W of Freeman Mill Rd.	10.9	4 lane freeway	8 lane freeway	Interstate	Yes
A5	P-3416	Norwalk Street Extension	Lee Street to Boston Road (rail crossing closing project)	0.3	N/A	3 lane	Local	No
A6		Spring Garden Street Median	Between Freeman Mill Rd. and Jackson St.	0.3	4 and 2 lane	Divided	Collector	No
Projects not completed in 2004								
B2		Friendly Avenue	Westridge Rd. to Holden Rd., add medians & LT lanes. (refer to 2014 for the remainder)	1.4	4 lane	4-5 lane	Minor Arterial	No
B3		Creek Ridge Road	Randleman Rd. to US 220. (refer to 2014 for the remainder)	1.2	2 lane	3 lane	Collector	No
B5		Elm-Eugene Street	Vandalia Rd. to Southern Urban Loop (I-85 Bypass). (right-of-way / planning only; refer to 2014 for the remainder)	1.1	2 lane	5 lane	Minor Arterial	No
B11		Horsepen Creek - Fleming Connector	Horse Pen Creek Rd. to Fleming Rd. (includes extending existing x-sections). (planning only; refer to 2014 for the remainder)	0.7	N/A	3 lane	Collector	No
B13	U-2913 (part)	Guilford College Road	Widen from Hornaday Rd. to Ruffin Rd. (refer to 2014 for more; remainder of the project is located in High Point)	1.1	2 lane	4-5 lane	Minor Arterial	Yes
B16	U-4015 (part)	Gallimore Dairy Road	NC 68 to I-40. (not open to traffic in '05 - refer to 2014 for more; remainder of the project is located out of area)	1.0	2 lane	5 lane	Collector	No
B18	U-2524 (part)	Western Urban Loop	I-85 to Lawndale Dr. (not open to traffic in '05; refer to 2014 for the remainder)	15.0	N/A	6 lane freeway	Interstate	Yes
B19	R-2413 (part)	NC 68 / US 220 Connector	Pleasant Ridge Rd. to US 220 & widening to Rockingham Co. line. (not open to traffic in '05 - refer to 2014 for more; remainder of the project is located in Rockingham Co.)	9.8	N/A	4 lane freeway	Interstate	Yes
B22	U-3612 (part)	Hilltop Road	Guilford College Rd. to Adams Farm Pkwy. (right-of-way only; refer to 2014 for the remainder)	1.0	2 lane	4-5 lane	Minor Arterial	No
B24	U-3313 (part)	Groometown Road	Wiley Davis Rd. to Wayne Rd. (right-of-way only; refer to 2014 for the remainder)	1.2	2 lane	4-5 lane	Minor Arterial	No
B26		Hornaday Road / Chimney Rock Road Connector	Hornaday Rd. to Chimney Rock Rd. (not open to traffic in '05; refer to 2014 for the remainder)	1.0	N/A	3 lane	Local	No
B32		East Market Street	Streetscape and Traffic Management. (refer to 2014 for the remainder)	1.5	6 lane divided	4 lane divided	Principal Arterial	No



2005-2014

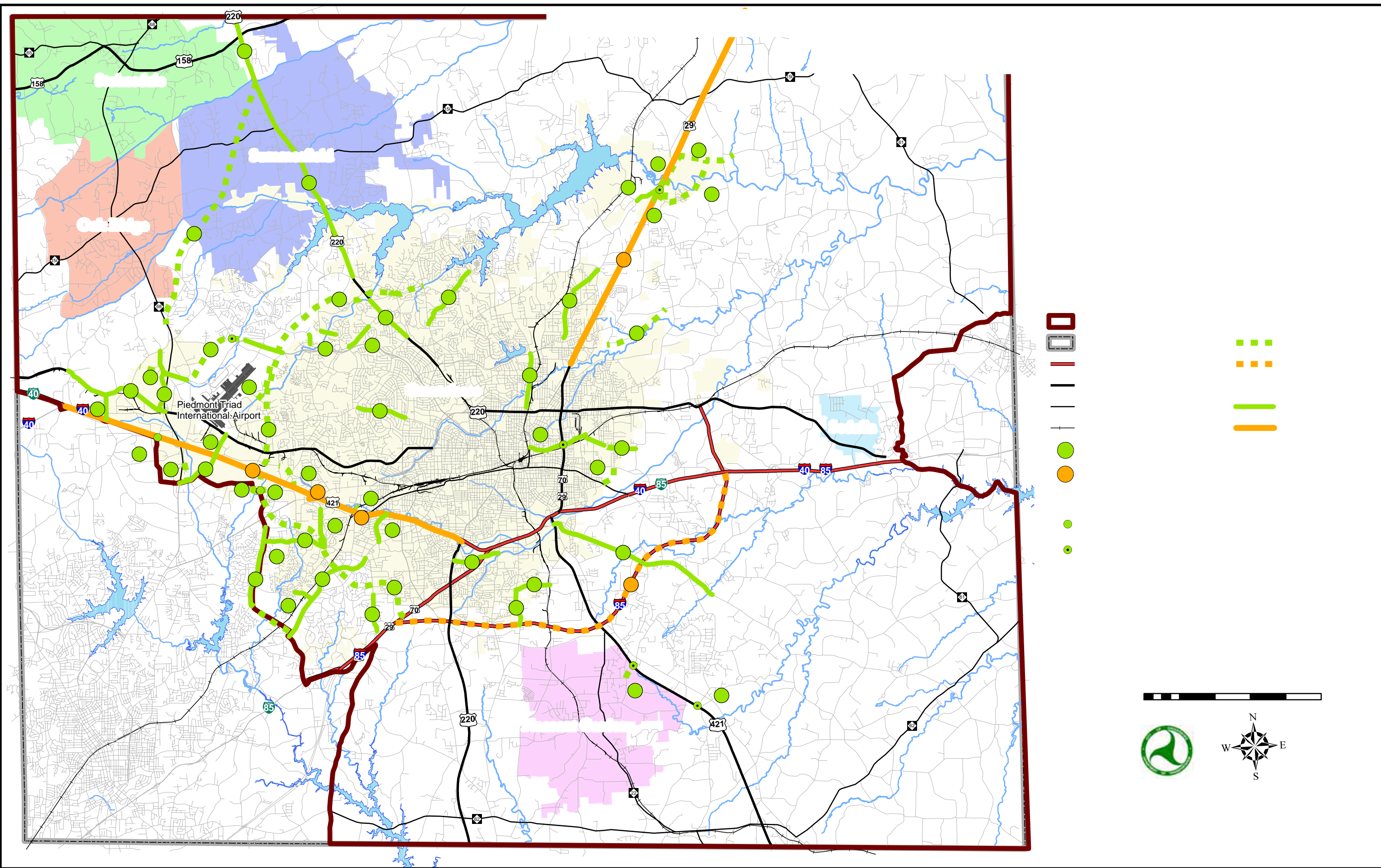
A significant amount of investment programmed and funded in the TIP is scheduled for completion during this time period including the western portion of the Greensboro Urban Loop and the NC 68/220 connector. This time period also reflects several projects programmed in the City of Greensboro Capital Improvements Program.

Table 3.11 — 2014 Roadway Projects

2005 - 2014								
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
B1		New Garden Road	Jefferson Rd. to Brassfield Rd.	1.0	2 lane	4-5 lane	Minor Arterial	No
B2		Friendly Avenue	Westridge Rd. to Holden Rd., add medians & LT lanes (refer to 2004 for the remainder)	1.4	4 lane	4-5 lane	Minor Arterial	No
B3		Creek Ridge Road	Randleman Rd. to US 220 (refer to 2004 for the remainder)	1.2	2 lane	3 lane	Collector	No
B4		Franklin Boulevard / Florida Street Connector	McConnell Rd. to Lee St.	0.6	2 lane	3-4 w/ median	Collector	No
B5		Elm-Eugene Street	Vandalia Rd. to Southern Urban Loop (I-85 Bypass) (refer to 2004 for the remainder)	0.8	2 lane	5 lane	Minor Arterial	No
B6	R-2309	US 220	Horsepen Creek Rd. to US 220 - NC 68 Connector	6.3	2 lane	4-5 lane	Principal Arterial	Yes
B7		Mackay Road	High Point Rd. to Adams Farm Pkwy.	0.5	2 lane	5 lane	Collector	No
B8		Battleground Avenue	Cotswold Ave. to Westridge Rd.	1.3	5 lane	6-7 lane	Principal Arterial	Yes
B9		Stanley Road	Koger Blvd. to Hilltop Rd.	1.1	2 lane	5 lane	Collector	No
B10		Church Street	Cone Blvd. to Northwood St.	1.5	3 lane	5 lane	Collector	No
B11		Horse Pen Creek - Fleming Connector	Horse Pen Creek Rd. to Fleming Rd. (includes extending existing cross-sections) (refer to 2004 for the remainder)	0.7	N/A	3 lane	Collector	No
B12		Vandalia Road	Elm-Eugene St. to Pleasant Garden Rd.	1.0	2 lane	5 lane	Minor Arterial	No
B13		Summit Avenue	McKnight Mill Rd. to Brightwood School Rd.	2.3	2 lane	4-5 lane	Minor Arterial	No
B14		Summit Avenue	Bryan Park to Reedy Fork Pkwy.	0.8	2 lane	4-5 lane	Minor Arterial	No
B15	R-2611	West Market St.	NC 68 to Bunker Hill Rd.	3.6	2 lane	4-5 lane	Major Collector	Yes
B16	U-4015 (part)	Gallimore Dairy Road	NC 68 to I-40 (refer to 2004 for more; remainder of the project is located out of area)	1.0	2 lane	5 lane	Collector	No
B17	U-2524 (part)	Western Urban Loop	I-85 to Lawndale Dr. (refer to 2004 for the remainder)	15.0	N/A	6 lane freeway	Interstate	Yes
B18	U-2524 (part)	Chimney Rock Road Extension	Existing facility to Old Oak Ridge Rd. (part of B17)	1.3	N/A	2 lane	Local	No
B19	R-2413 (part)	NC 68 / US 220 Connector	Pleasant Ridge Rd. to US 220 + widening to Rockingham Co. line (refer to 2004 for more; remainder of the project is located in Rockingham Co.)	9.8	N/A	4 lane freeway	Interstate	Yes
B20		Merritt Drive	I-40 to High Point Rd.	1.0	3 lane	5 lane	Collector	No
B21	U-2913 (part)	Guilford College Road	Widening from Ruffin Rd to new alignment	2.3	2 lane	4-5 lane	Minor Arterial	Yes
			New alignment from widening to High Point Rd. (refer to 2004 for more; remainder of the project is located in High Point)	1.5	N/A	4 lane divided	Minor Arterial	Yes
B22	U-3612 (part)	Hilltop Road	Guilford College Rd. to Adams Farm Pkwy. (refer to 2004 for the remainder)	0.6	2 lane	4-5 lane	Minor Arterial	No
B23	U-2412 (part)	High Point Road	Hilltop Rd. to Proposed US 311 Bypass (portion in High Point MPO)	3.8	3 lane	4-5 lane	Principal Arterial	Yes

2005 - 2014 (continued)								
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
B24	U-3313 (part)	Groometown Road	Wiley Davis Rd. to Wayne Rd. (refer to 2004 for the remainder)	1.2	2 lane	4-5 lane	Minor Arterial	No
B25	U-4006	Bridford Parkway Extension	Wendover Ave. at Hornaday Rd. to Burnt Poplar Rd. at Swing Rd.	1.1	N/A	5 lane	Collector	No
B26		Hornaday Road / Chimney Rock Road Connector	Hornaday Rd. to Chimney Rock Rd. (refer to 2004 for the remainder)	1.0	N/A	3 lane	Local	No
B27	U-2524 (part)	Hornaday Road / Chimney Rock Road Connector	Bridge over Urban Loop	N/A	N/A	3 lane	N/A	No
B28		Reedy Fork Service Road	Turner-Smith Rd. Ext. to Reedy Fork Pkwy.	1.4	N/A	5	Local	No
B29		Reedy Fork Parkway	Turner-Smith Rd Ext to Eckerson Rd.	2.2	N/A	3	Local	No
B30		Turner Smith Road Extension	Connect Brown Summit Rd. to Turner Smith Rd.	2.0	N/A	3 lane	Major Collector	No
B31		Lake Jeanette Road	Lawndale Ave. to N Elm St. / Bass Chapel Rd.	2.2	2-3 lane	3-5 lane	Local	No
B32		East Market Street	Streetscape and Traffic Management (refer to 2004 for the remainder)	1.5	6 lane divided	4 lane divided	Principal Arterial	No
B33	U-2524 (part)	Lake Brandt / Cotswold Connector	Lake Brandt Rd. to Cotswold Rd. (part of B17)	0.3	3 lane	3 lane	Collector	No
B35	R-2612 (part)	US 421	Williams Dairy / Neelley Rd. realignment & interchange + US 421 interchange with Woody Mill Rd. (and future Hagen Stone Park Rd. Connector)	1.2	2 lane	3-5 lane	Freeway / Expressway & Collector	Yes
B36	R-4707	US 29	Eckerson Rd. / US 29 Interchange + 1 mile of freeway upgrade (Assumes U-2524 includes widening of remaining US 29 south to Urban Loop)	1.0	4 lane freeway	6 lane freeway	Freeway/Expressway	Yes
B37	U-4711	Greensboro Signal / ITS System		N/A	N/A	N/A	N/A	No
B38		Church Street	Streetscape, Lindsay St. to Friendly Ave.	0.3	N/A	N/A	Collector	No
B39		East Cone Boulevard Extension	Nealtown Rd. to Hines Chapel Rd.	2.0	N/A	4 lane divided	Minor Arterial	Yes
B40	U-2815 C	Bryan Boulevard	Inman Rd. to NC 68 (relocate roadway & construct interchange at Old Oak Ridge Rd.)	1.9	4 lane divided	4-6 lane divided	Freeway/Expressway	Yes
B41		Holts Chapel Road Upgrade	Alignment & cross-section improvements, E Market St. to Ward Rd.	1.6	2 lane	2-3 lane	Collector	No
B42		Pegg Rd. - Thatcher Rd. Connector	Gallimore Dairy Rd. to Pleasant Ridge Rd. widening and new grade separation at I-40	2.1	N/A	4 lane divided	Collector	No
B43		Bryan Boulevard Extension	NC 68 to Pleasant Ridge Rd.	0.8	N/A	4 lane divided	Major Collector	No
B44		Sandy Ridge Road	I-40 to Market St.	1.0	2 lane	4 lane divided	Major Collector	No
B45		Alamance Church Road	US 421 to Southeast School Rd.	4.7	2 lane	5 lane	Minor Arterial	Yes
B46	U-4015 (part)	Gallimore Dairy Road	I-40 to Market St.	0.6	2 lane	5 lane	Collector	No
B47		Hilltop Road	Widen from Adams Farm Pkwy to Stanley Rd.	1.3	2 lane	5 lane	Minor Arterial	No
B49		Norwalk Street Connector	Boston Rd. over railroad to existing roadway	0.3	N/A	3 lane	Collector	No
B50		Brigham Road	Widen from West Market St. to Pleasant Ridge Rd.	1.7	2 lane	4 lane divided	Collector	No
B51		Regional Road Extension	Gallimore Dairy Rd. to Regional Rd. north of Hickory Ridge Rd. (part existing)	0.6	N/A	3 lane	Collector	No

2005 - 2014		(continued)						
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
Projects not completed in 2014								
C1	R-2577 (part)	US 158	Forsyth Co. Line to US-220 (in conjunction w/ Bypass) (refer to 2020 for more; remainder of the project lies in Forsyth and Rockingham Cos.)	4.6	2 lane	4-5 lane	Minor Arterial	Yes
C7	U-2525 (part)	Eastern Urban Loop	Lawndale Dr. to US 70 (refer to 2020 for the remainder)	13.0	N/A	6 lane freeway	Interstate	Yes

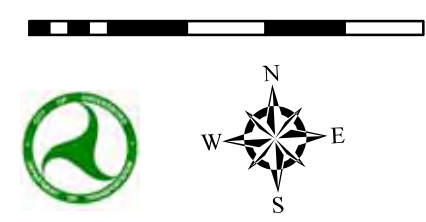
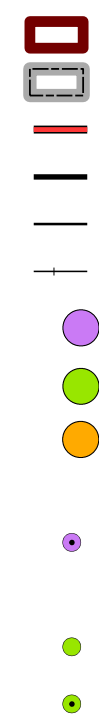
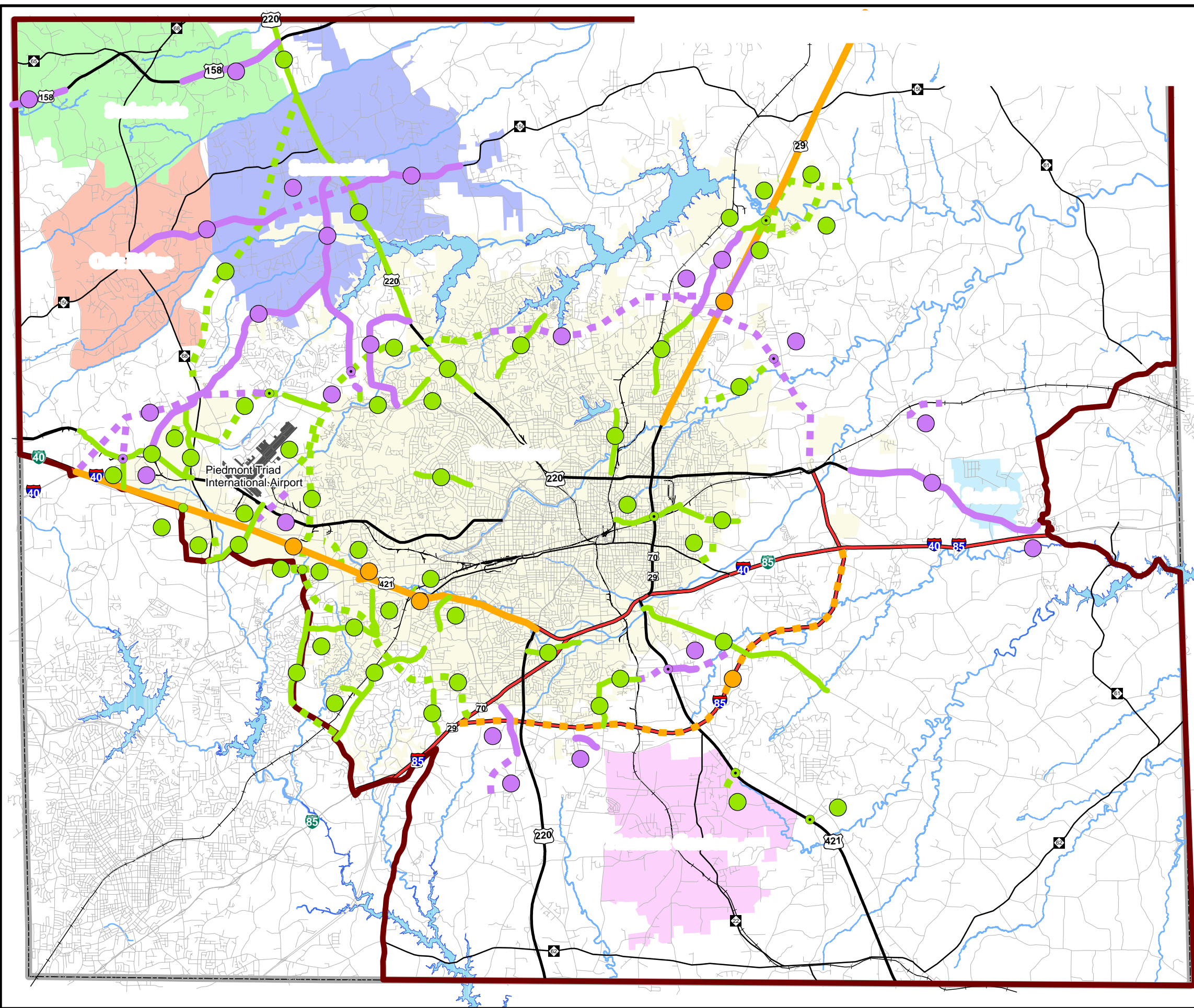


2015-2020

This period includes the completion of the final segments of the Urban Loop project as well as the I-40/NC 68/I-73 Connector and other airport area projects. This period also includes a number of significant connections and widenings as identified on the Thoroughfare Plan including the widening of US 70 east of Greensboro to the Alamance County line.

Table 3.12 — 2020 Roadway Projects

2015 - 2020								
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
C1	R-2577 (part)	US 158	Forsyth Co. Line to US 220 (includes Stokesdale Bypass). (refer to 2014 for more; remainder of the project lies in Forsyth Co.)	6.8	2 lane	4-5 lane	Minor Arterial	Yes
C2	R-2910 (part)	US 70	Rock Creek Dairy Rd. to Alamance County Line (.3 to MAB). (remainder of the project lies in Alamance Co.)	0.3	2 lane	5 lane	Major Collector	Yes
C3	U-2581	US 70	Mt Hope Church Rd. to Rock Creek Dairy Rd.	5.2	2 lane	5 lane	Minor Arterial	Yes
C4		Fleming Road / Lewiston Road	Fleming Rd. to Lewiston Rd. connection and interchange at Urban Loop	0.6	N/A	4-5 lane	Freeway / Expressway & Minor Arterial	Yes
C5		Horsepen Creek Road	New Garden Rd. to Battleground Ave.	3.4	2 lane	4-5 lane	Collector	No
C6		Summit Avenue	Brightwood School Rd. to Bryan Park Rd.	2.6	2 lane	3-5 lane	Minor Arterial	No
C7	U-2525 (part)	Eastern Urban Loop	Lawndale Dr. to US 70. (refer to 2014 for the remainder of the project)	13.0	N/A	4-6 lane freeway	Interstate	Yes
C8		E Cone Blvd / Urban Loop Interchange	Interchange with East Cone Blvd. and Urban Loop	N/A	N/A	N/A	Interstate	Yes
C9		I-40 / NC 68 / I-73 Connector	Old Oak Ridge Rd. to I-40	7.6	N/A	4-6 lane freeway	Interstate	Yes
C10		NC 150 Realignment	New location, from Brookbank Road to US 220 (see C20 for remainder)	1.9	N/A	2 lane	Major Collector	No
C11		Hicone Road Extension	Lee's Chapel Rd. to Summit Ave.	0.8	N/A	3 lane	Minor Arterial	No
C12		Carmon / McLeansville Road Connector	Knox Rd. to McLeansville Rd.	1.1	N/A	2 lane	Collector	No
C13		Gallimore Dairy Road / Friendly Avenue	Realign for continuity	0.2	5 lane	5 lane	Minor Arterial	No
C14		Ritters Lake Road Realignment	Connect with Wolfetrail at Randleman Rd.	0.4	2 lane	3 lane	Minor Arterial	No
C15		Sandy Ridge Road Extension	Market St. to Airport Connector and interchange at Market St.	1.0	N/A	4 lane divided	Major Collector	Yes
C17		Pleasant Ridge Road	Lewiston Rd. to Summerfield Rd.	5.0	2 lane	5 lane	Major Collector	Yes
C18		Vandalia Road Extension	Pleasant Garden Rd. to Alamance Church Rd. & US 421 interchange	2.7	N/A	5 lane	Freeway / Expressway & Minor Arterial	Yes
C19		South Holden Road	South of Bus. I-85 to Kivett Dr. - part on new location	2.4	2 lane	4-5 lane	Minor Collector	No
C20		NC 150 Realignment / Widening	On existing Brookbank Road and existing Auburn Road from NC 68 Lake Brandt Road (see C10 for remainder)	7.5	2 lane	3 lane	Major Collector	No
C21		Pleasant Ridge Road	Market St. to Lewiston Rd.	8.0	2 lane	3 lane	Major Collector	No



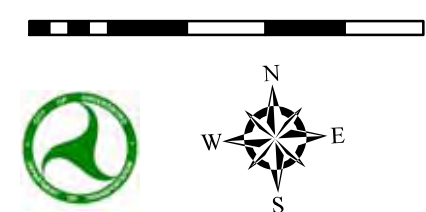
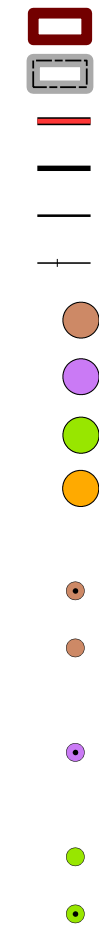
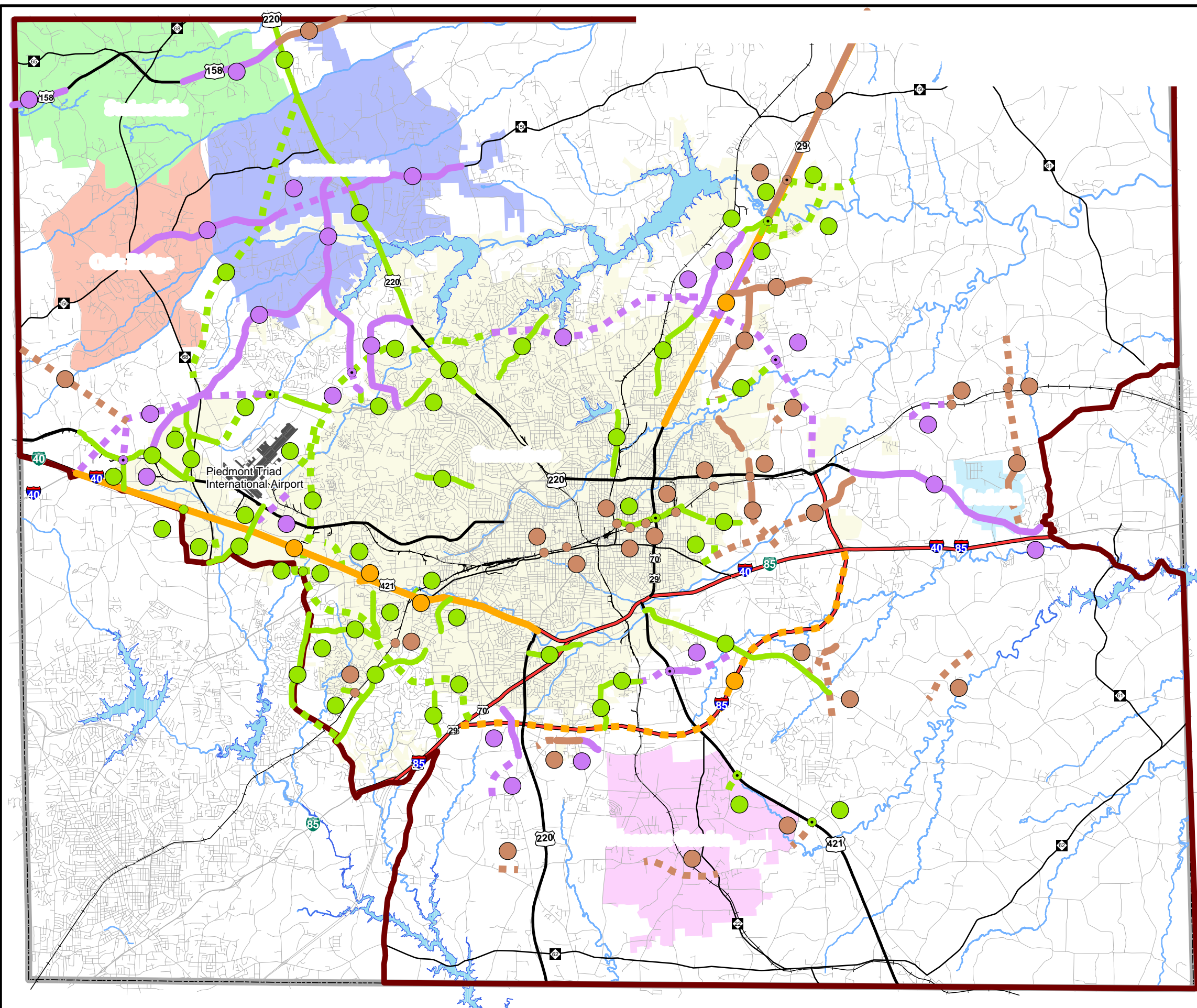
2021-2030

Noteworthy projects include improvements along US Hwy 29, a series of railroad grade separations, and the Airport Connector. It is also anticipated that the remaining lower priority Thoroughfare Plan connections will be completed.

Table 3.13 — 2030 Roadway Projects

2021 - 2030								
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
D1	R-2580 (part)	US 158	US 220 to Rockingham Co. Line. (remainder of the project lies in Rockingham Co.)	1.5	2 lane	4-5 lane	Minor Arterial	Yes
D2		US 29	New single point urban interchange at Brown Summit / Turner Smith Connector	N/A	N/A	4-6 lane	Interstate	Yes
D3		Penry / Ward / Youngs Mill Connector	McConnell Rd. to Huffine Mill Rd. (realign & improve existing)	3.1	2 lane	3 lane	Major Collector	Yes
D4		Franklin Road	Railroad grade separation	N/A	N/A	N/A	N/A	No
D5		Ward Road	Railroad grade separation	N/A	N/A	N/A	N/A	No
D6		Mackay Road	Railroad grade separation	N/A	N/A	N/A	N/A	No
D7		Hilltop Road	Railroad grade separation	N/A	N/A	N/A	N/A	No
D8		Aycock Street	Railroad underpass replacement (in conjunction with PART)	N/A	N/A	N/A	N/A	No
D9		East Market Street	Railroad underpass replacement	N/A	N/A	N/A	N/A	No
D10		Rankin Mill / Flemingfield Connector	South of Keeley Rd. to Huffine Mill Rd.	0.7	2 lane	3 lane	Collector	No
D11		High Rock Road Extension	US 70 to Frieden Church Rd. (connect & improve existing facilities)	5.5	2 lane	2 lane	Collector	No
D12		Wades Store Road Extension	Mt. Hope Church Rd. to Alamance Church Rd.	1.7	2 lane	2 lane	Local	No
D13		NC 62 / Liberty Road	New Garden Rd. to Bulb Rd.	1.1	2 lane	2 lane	Major Collector	No
D14	R-2612 (part)	Burnetts Chapel / Steeple Chase / Hagen Stone Park Connector	Burnetts Chapel Rd. to Company Mill Rd., new alignments	3.3	N/A	2 lane	Freeway/Expressway & Collector	Yes
D15		Airport Connector	Sandy Ridge Rd. Ext. (at I-73 Connector) to Forsyth Co. (remainder to Winston-Salem Urban Loop / I-74)	3.7	N/A	4 lane freeway	Freeway/Expressway	Yes
D16		Strawberry Road Extension	NC 150 to Lake Brandt Rd.	1.4	2 lane	2 lane	Local	No
D17		Youngs Mill / Southeast School Connector	Millpoint Rd. to Southeast School Rd.	1.2	N/A	2 lane	Minor Arterial	Yes
D18		US 29	Widen & upgrade to interstate, north of Urban Loop to Rockingham Co. line	5.5	4 lane freeway	6 lane freeway	Interstate	Yes
D19		South Dudley Street	Railroad grade separation (in conjunction with PART)	N/A	N/A	N/A	N/A	No
D20		South English Street	Railroad grade separation	N/A	N/A	N/A	N/A	No
D21		Colony Road	Railroad grade separation	N/A	N/A	N/A	N/A	No
D22		Tate Street	Railroad grade separation (in conjunction with PART)	N/A	N/A	N/A	N/A	No
D23		Benbow Road	Railroad grade separation (in conjunction with PART)	N/A	N/A	N/A	N/A	No
D24		Nealtown Road / McKnight Mill Road Connector and Extension	Huffine Mill Rd. to Eckerson Rd. (connect & improve existing facilities)	4.0	2 lane	2-3 lane	Major Collector	No
D25		Knox Road Extension	Carmon to Frieden Church Rd., w/ railroad grade separation	0.3	N/A	2 lane	Collector	No
D26		Creekview / Butler Road Connector	McCleansville Rd. to Huffine Mill Rd.	0.3	N/A	2 lane	Local	No

2021 - 2030 (continued)								
ID	TIP#	Facility	Description / Extents	Length (miles)	Existing # Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?
D27		Williams Dairy / Millpoint Road Connector	Millpoint Rd. to Williams Dairy Rd.	0.6	N/A	2 lane	Collector	No
D28		Bishops Road - Ritters Lake Road Connector	S. Holden Rd. to Ritters Lake Rd.	0.8	2 lane	3 lane	Collector	No
D29		Florida Street Extension	Franklin Blvd. Ext. to Mt. Hope Church Rd. (new & improve existing)	4.0	N/A	4 lane divided	Major Collector	Yes
D30		Hicone Road Widening	US 29 to Hines Chapel Rd.	3.3	2 lane	5 lane	Minor Arterial	No
D31		Summit Ave Extension (info only, not in LRTP)	Greenbrook Rd to Benaja Rd	1.4	N/A	2 lane	Local	No



The following table consists of projects that are exempt from air quality conformity regulations. These projects may therefore proceed in the event of a conformity lapse.

Table 3.14 — Exempt Projects List

ID	Facility	TIP#	Description / Extents	(miles)	# Lanes	Horizon Year # Lanes	Federal Functional Class	Regionally Significant?	Exempt?	Reflected in Network Coding?	CMAQ	New / Revised Since Last Plan
2004 Horizon Year												
A2	US 29	R-984	16th St. to Rockingham county line (pavement rehab)	10.9	4 lane divided	4 lane divided	Freeway/Expressway	Yes	Yes	Yes		
A6	Spring Garden Street Median		Between Freeman Mill Rd. and Jackson St.	0.3	4 and 2 lane	Divided	Collector	No	Yes	No		
2014 Horizon Year												
B32	East Market Street		Streetscape and Traffic Management		6 lane divided	4 lane divided	Principal Arterial	No	Yes	Yes		New
B37	Greensboro Signal / ITS System	U-4711		N/A	N/A	N/A	N/A	No	Yes	No	Yes	
2030 Horizon Year												
D4	Franklin Road		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D5	Ward Road		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D6	Mackay Road		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D7	Hilltop Road		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D8	Aycock Street		Railroad underpass replacement (in conjunction with PART)	N/A	N/A	N/A	N/A	No	Yes	N/A		
D9	East Market Street		Railroad underpass replacement (in conjunction with PART)	N/A	N/A	N/A	N/A	No	Yes	N/A		
D19	South Dudley Street		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D20	South English Street		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D21	Colony Road		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D22	Tate Street		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	N/A		
D23	Benbow Road		Railroad grade separation	N/A	N/A	N/A	N/A	No	Yes	Yes		New

Environmental Screening

Introduction

Historically, analysis of the impacts of transportation projects on communities and the natural environment occurred during individual project planning and design. This approach is reasonable, since many impacts cannot be accurately determined until specific design decisions have been made. However, there are several important reasons for conducting an earlier, system-planning level environmental screening of proposed LRTP projects.

First, a preliminary environmental impact screening can identify potentially serious impacts that could end up stopping a project. Recognizing such issues at the earliest possible stage of the planning process provides the opportunity to avoid or mitigate undesirable impacts, through modification (or even elimination) of the project. Early “fatal flaw” analysis of this type helps reduce the possibility that subsequent, more detailed analyses will uncover unexpectedly serious environmental impacts. This approach helps reduce the risks inherent in an uncertain planning process, and helps ensure that time and resources are not expended unnecessarily.

Second, a systems-level environmental screening allows consideration of the interactions among various projects. Rarely does a project stand completely alone, independent of other projects. The combined impacts of a several projects can vary substantially from the summation of individual project impacts. Furthermore, the modification or elimination of one project due to environmental considerations can significantly alter the performance or impacts of other projects. It is important, therefore, to be able to assess project impacts in the context of the entire LRTP.

Finally, although system-level environmental screening does not substitute for detailed, project-specific review, this assessment can identify and highlight issues warranting further analysis. This knowledge not only reduces the likelihood of unexpected environmental impacts; it permits future environmental studies to focus on critical issues. The result is a transportation plan that not only minimizes negative impacts on the natural and man-made environments, but one that is ultimately more efficient, timely, and cost-effective.

This environmental screening process and its results reflect the reality that the overwhelming majority of the Recommended LRTP's environmental impacts are associated with roadway projects. This is understandable, given the potential disruption

caused by the construction of more than 200 lane-miles of permanent infrastructure. Once a few critical decisions have been made, constraints on roadway cross-sections and alignments (due to safety factors and design criteria) limit opportunities to avoid or reduce these negative impacts.

Sidewalks and bicycle facilities are much more limited in the magnitude of their environmental and community impacts, due to smaller cross-sections and greater flexibility in design. Furthermore, pedestrian and bicycle facilities are most often built in conjunction with roadway facilities, and have only marginal environmental impacts, if any, beyond those of the roadway itself. In addition, bicycle and pedestrian travel is inherently less disruptive to the environment than travel by automobile, especially with respect to air pollution, noise, and energy consumption.

Most of the transit elements in the LRTP are associated with bus route and service expansions, which typically involve no new construction, and have minimal negative impacts on either natural or man-made environments. In general, transit impacts tend to be positive, in that increased service tends to reduce VMT and typically improves accessibility in disadvantaged neighborhoods. The proposed PART regional rail and bus rapid transit systems are the only transit elements that could generate significant environmental and community impacts associated with new construction. It is difficult to identify environmental impacts for these facilities in the context of this LRTP update, however, due to the specialized nature of these facilities, and given that they are still in the early planning stages. Specific studies (some of which are already underway) will be needed to assess the impacts of these transit systems.

The following discussion of the Recommended LRTP's environmental screening process is divided into two parts. The first focuses on overall impacts to the natural and cultural environments. The second section addresses specific issues related to environmental justice.

Environmental Impacts

A qualitative screening was performed to assess the potential environmental impacts of the roadway projects recommended for inclusion in the Greensboro Urban Area 2030 LRTP. This analysis consisted of overlaying project alignments/locations onto a series of maps depicting sensitive natural and community resources — **Maps 4.1 and 4.2**. Any proposed project determined to encroach on a sensitive area was identified. The nature and degree of conflict determines the level of impact assessed. For example, a roadway alignment across a stream is generally